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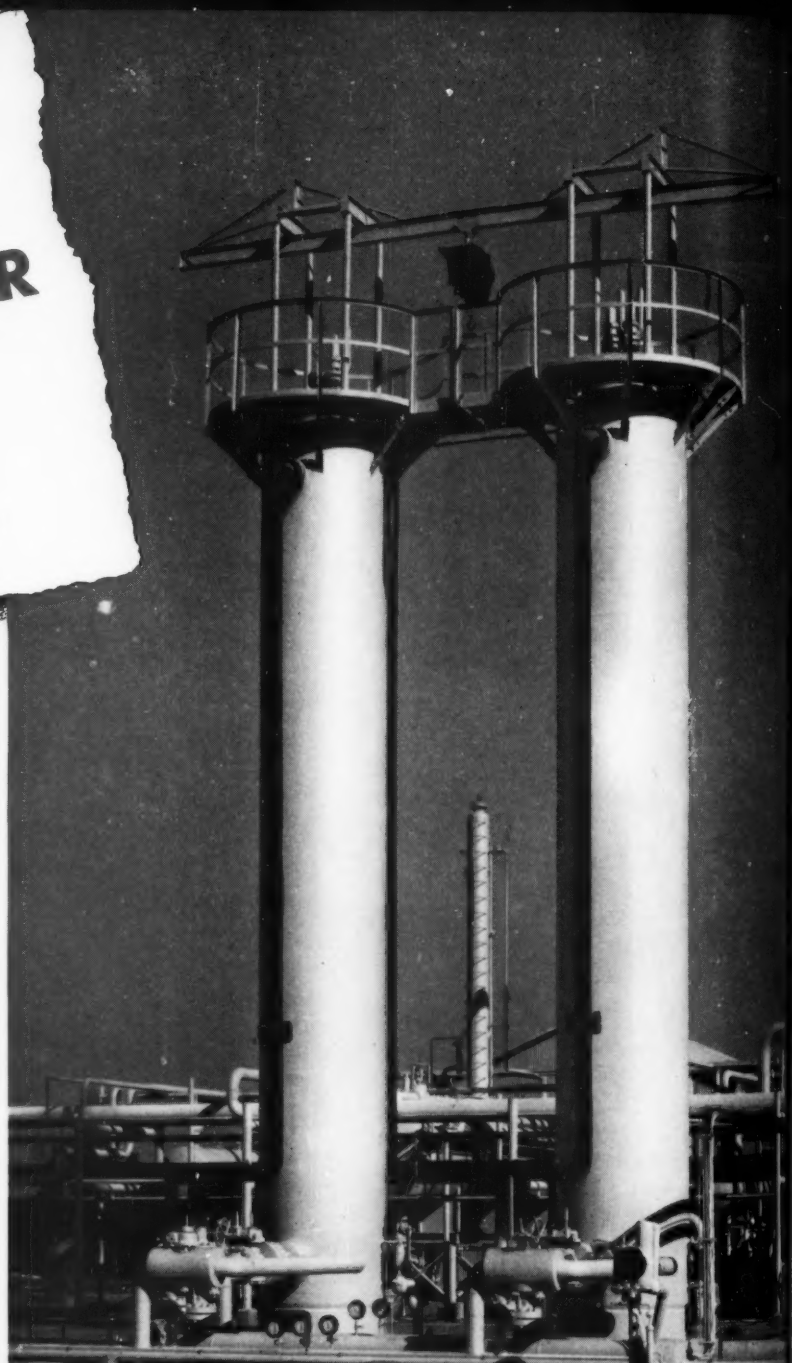
TWIN DEHYDRATOR TOWERS

. . . for new gasoline plant



The two 4½-ft. by 33-ft. dehydrator towers shown at the right were built at one of our plants for the Arkansas Fuel Oil Company's Panola gasoline plant near Carthage, Texas. Designed with a capacity of 100,000,000 cu. ft. per day, this modern plant now processes gas from 28 wells, which is delivered to it under 1050 lbs. per sq. in. pressure. After passing through an absorber, the incoming wet gas is delivered to one of the two dehydrator towers, both of which are packed with activated bauxite desiccant. About 10 per cent of the inlet gas is diverted for use as a regenerating medium. Provision has been made to allow one dehydrator tower to be in operation while the other is being regenerated.

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Gas Investigators Report

THE delayed final report of the natural-gas investigation by Commissioners Smith and Wimberly of the Federal Power Commission gives Congress, the state conservation bodies, and the oil and gas industry the background from which it should be possible to arrive at legislation required to re-define the 1938 regulatory act.

The recommendations in regard to the separation of interstate transportation and the production of natural gas may not go as far as many within the industry feel is desirable. But the report generally is sympathetic to the problems of operators and can be used as the base in new legislation which would end the assumed powers of regulations never delegated to the commission by Congress in the original act.

It should be kept in mind that the Smith-Wimberly conclusions are not subscribed to by two other members of the commission, who favor the extension, not the restriction, of federal controls. With the fifth seat of the commission vacant there is now little likelihood of a majority report, so far as this investigation is concerned.

The report recommends that the Natural Gas Act be clarified so that it is understood that independent producers and gatherers of natural gas are not subject to regulation by the commission. The conclusions agree with those of the courts which have criticized the cost formulas that have been used in determining purchase prices for gas produced by interstate companies or their affiliates. A somewhat ambiguous commodity "value" is suggested as a substitute.

At the consuming end of the lines the report goes on record as against arbitrary determinations as to the "proper" use of natural gas in competition with other fuels and in favor of end uses determined in economic terms of price and service.

In agreeing to the restriction of federal controls to the interstate transportation of natural gas, the court emphasizes the duty of the state regulatory bodies and the gas industry in so conducting their activities that there is no justification for public and consumer criticism.

Particular emphasis is placed on the necessity of reducing the field wastage of casing-head gas to a minimum. State laws recognizing the correlative rights of all producers and which would provide severe penalties for the waste of gas to air are urged. The encouragement of unit operation and the equitable sharing of markets should be part of state legislation.

Those opposing revisions in the Natural Gas Act have offered the excuse that they wanted a final FPC report on the investigation which started 3½ years ago. They now have it, based on findings of 85 hearing days and 15,000 pages of transcript. There should be no further delays in pending Congressional action needed to assure the further rapid extension of gas services to consumers and protection to all the operating branches of the industry.

Chiefs of Staff, Munitions Board Favor Steel Exports for Tapline

WASHINGTON.—A final determination on further exports of pipe for the trans-Arabian pipe line has not yet been reached, although authority for the shipment of 3,000 tons was granted last week, it was disclosed April 30 by Defense Secretary James V. Forrestal.

In another of his several appearances before Chairman Kenneth S. Wherry of the Senate small business oil subcommittee, Forrestal said two studies have been made of the Middle East oil situation, one by the Joint Chiefs of Staff and the other by the Munitions Board. Both groups, he said, recommended that the National Military Establishment should support the second quarter application for steel pipe for the trans-Arabian line.

Seven Agencies Involved

Forrestal said the company's original application for the second quarter was for 55,000 tons, but indicated the maximum which would be permitted for the period would be 33,000 tons. While he is responsible for the decision from the standpoint of national security, he told Wherry, seven other agencies also have a voice in the determination of export quotas.

The secretary gave no explanation why so long a time is required to reach a decision which he told the subcommittee on March 17 would be made within 48 hours.

As Forrestal appeared before the subcommittee the Office of International Trade announced second quarter export quotas for oil line pipe and other iron and steel products.

The quotas call for 55,000 tons of seamless casing and oil line pipe, of which 49,000 tons is for projects and 6,000 tons commercial sale; 35,000 tons of welded casing and oil line pipe, of which 31,000 tons is for projects; and 5,500 tons of seamless black and 20,000 tons of welded black pipe.

The 31,000 tons of welded casing and line pipe shown for projects includes the 3,000 tons authorized for the trans-Arabian pipe line, the OIT said.

To Await Decision

Forrestal explained the 3,000 tons had been authorized because a ship was about to leave on which there was space for that quantity, but promised Wherry no further such shipments would be authorized until a decision has been made on the question of permitted continuance of construction of the line across the desert.

Wherry sought to impress Forrestal with the seriousness of the domestic situation, telling him that complaints are coming into the subcommittee by the "hundreds" of inability of manufacturers to get steel and that independent refinery operations have been restricted to less than 70 per cent of capacity because of the lack of steel to produce and transport more crude.

The whole project, Wherry told the secretary, is an "Arabian pipe dream."

House Gives Approval to Tidelands Bill by Overwhelming 257-29 Vote

WASHINGTON. — Despite charges by a die-hard minority that a powerful "oil lobby" was engineering a "gift" by the Government, the House on April 30 passed the tidelands bill by a smashing vote of 257 to 29, leaving no doubt that a presidential veto would be readily overridden.

The legislation, however, is still hanging fire in the Senate judiciary committee, which this week will hold further hearings to permit Sen. Forrest C. Donnell of Missouri to complete his crossexamination of witnesses who testified previously.

As was to be expected, the California and Texas delegation led the debate favoring the bill to settle title to the tidelands in the states, which until last June always had thought their claims of ownership were invulnerable.

What opposition there was developed under the leadership of Rep Adolph J. Sabath of Illinois, who denominated the measure an "outrageous gift to the oil companies," forced through a misled House by an oil lobby.

On the showdown, 8 Republicans, 21 Democrats and Rep. Vito Marcantonoi of New York, American Labor Party member, voted against the bill.

But whether the almost 9-to-1 vote by which the measure passed would be repeated to override a veto was subject to some doubt, since 149 members of the House were absent; proponents, however, claimed that even if the full membership voted the result would be far beyond the two-thirds necessary to override.

No such overwhelming vote is foreseen in the Senate when the bill comes up before that body. It is generally believed that the measure will be passed, but there are few who would bet the Senate would override a veto.

Tempo of Offshore Activity Increasing

HOUSTON.—The accelerating tempo of offshore drilling activity in the Gulf of Mexico was apparent last week in announcements concerning operations of Pure Oil Co., Humble Oil & Refining Co., and Ohio Oil Co.

Pure contracted with port officials at Orange, Tex., for facilities which will make Orange that company's base for its offshore operations. The contract provides for berthing space, a warehouse, and open areas for the storage of large quantities of pipe.

Humble filed application with the Army Engineers for a drilling permit for a well about 18 miles southwest of Buras off Plaquemines Parish. A steel platform and a moored LST will be used.

Ohio Oil asked a permit from the Army Engineers authorizing the driving of four test piles through a braced template at a location about 12.5 miles south of Freeport, Brazoria County, Texas. A platform will be constructed on top of the piling to support core-drilling equipment. Water at the site has a depth of 59 ft. below mean Gulf level.

Cities Service Oil Co. applied for a permit for temporary installations in connection with inshore seismograph work 7 miles northeast of Morgan City in St. Martin and Assumption parishes.

Humble Plant Is Given New-Industry Exemption

BATON ROUGE. — The Louisiana Department of Commerce and Industry has approved Humble Oil & Refining Co.'s application for a new-industry tax exemption for the natural-gasoline plant which Humble plans to build at Opelousas, St. Landry Parish. The exemption was for $3,468,000 in capital outlay, not including land cost. The exemption was granted subject to further study by the department's investigators.

Ball Questions Adequacy of Steel Need Estimates; Cuts Certain

WASHINGTON.—The National Petroleum Council's estimates of the oil industry steel requirements finally reached the Commerce Department last month, together with a review by Max W. Ball, director of the Oil and Gas Division, in which grave doubts were expressed over the adequacy of the tonnages sought for such activities as drilling and tanker construction.

Even before the figures reached the department, however, Clifford A. Hahn, head of the oil division of the Office of Industrial Cooperation, had been told by steel industry representatives that the petroleum demands could not be met in some categories under any circumstances and in others only by taking steel away from other consumers.

An interesting sidelight on what constitutes steel demand was given by a statement that if steel is to be taken away from any industry, it is not the automobile industry but the toy makers that should lose it. Toy manufacturers, it was said, compete with the automobile producers for steel and are in a less essential category; in the aggregate they use a significant tonnage annually.

Full Quantities Needed

In his review, Ball declared that the full quantities requested by the industry must be provided if it is to fill the needs of the domestic market and provide minimum exports. If any branch has to be cut, he suggested, a reduction in marketing items probably would create less difficulty than curtailment of those for production, refining or transportation, whether oil or gas, domestic or foreign.

On the whole, he said, the assumptions and estimates are essentially conservative, in the case of tonnage for drilling possibly dangerously low. On the other hand, the estimates for foreign requirements could well be cut by the 102,000 tons provided for Middle East pipe lines, since rights-of-way have not yet been secured and the pipe could not be delivered within the period covered by the estimates.

Ball pointed out that much of the steel covered in the estimates is not ordinarily charged to the oil industry, but regardless of that it is needed if consumer demand is to be met.

"Much of the estimated steel will be bought in the open market from fabricators, supply houses and others in the normal course of business without allocations or priorities; is so being bought now and will doubtless continue to be," he went on.

"Much of such steel has never been considered as petroleum-industry steel.

"Part of the estimated steel is doubtless already on order and some of it may already have been delivered.

"Part of the estimated steel cannot be delivered within the specified period for lack of fabricating capacity.

"We have been told that a minority of the categories of steel requested are in short supply and that still fewer are critical."

Texas Establishes New Leasing Requirements

AUSTIN.—New leasing requirements including royalty of one-sixth for certain tracts were set up by the State School Land Board in calling for bids for mineral leases on 160,314 acres of state land in 63 counties.

The board announced the forthcoming sale June 1 will "broaden" previous bidding procedure to provide for submission of bids under two new classifications. These raise minimum requirements on areas near or within proved territory.

The new system was set up at the insistence of Price Daniel, attorney general, who with Gov. Beauford H. Jester, and Bascom Giles, commissioner of the General Land Office, comprises the School Land Board. Daniel said he thought the state should get a better price on land offered to prevent drainage by nearby fields.

The type of bid customary in the past calling for the usual bonus offer, fixed rental, and one-eighth royalty will now apply only to tracts which are strictly wildcat prospects.

One of the new classes of bids applies to land within 1 to 2 miles of production. This will require one-sixth royalty, bonus, and rental. The second new group of tracts are those "very close" to or within proved areas. These require fixed bonus, rental and bidding starting at a minimum of one-eighth. In addition, the board set a minimum rental of $1 an acre for all areas.

The 160,314 acres on which bids will be accepted June 1 consist mainly of river beds, bays, and inlets, although some surveyed acreage is included.

Louisiana, Oklahoma Allowables Increased

The Louisiana oil allowable for May has been set by the department of conservation at 521,317 bbl. daily, another in a series of consecutive monthly increases which began more than 2 years ago. The allowable for May is an increase of 4,562 bbl. daily over April. Allocation of the Louisiana production is as follows: South Louisiana fields, 391,543 bbl. daily; and North Louisiana fields, 129,774 bbl. daily.

Kansas allowable oil production for May remained at 290,000 bbl. daily as set by the state corporation commission.

Oklahoma's allowable for May was set at 410,000 bbl. daily by the state corporation commission, an increase of 5,000 bbl. daily over the previous month's allowable.

New Mexico's allowable for May has been set at 135,000 bbl. daily, unchanged from the previous month.

Next Week . . .

The next issue will be The Journal's International Petroleum Exposition special issue No. 1, featuring:

A large map of the exposition grounds, showing booth locations and containing a grid system to facilitate the locating of each exhibit. On the back will be the names of all exhibitors and the booth numbers of their exhibits. The map will be a loose-leaf insert.

A 70-page directory of exhibitors, giving the name and location at the exposition of each exhibitor, a description of the equipment each will display, and the names of company officials who will be on hand.

A program of events scheduled during the 8-day oil show.

A story describing the spectacular Hall of Science.

In Addition . . .

The Journal will cover the Interstate Oil Compact Commission meeting in Chicago and the meeting of the Pacific Coast District of the American Petroleum Institute's Division of Production.

Centrifugal Pumps to Have Big Use in Gas Lines, A. G. A. Told

by Dahl M. Duff

HOUSTON.—Results thus far in the first application of centrifugal compressors to high-pressure gas transmission by Texas Eastern Transmission Corp. indicate this equipment has a very definite place in the gas industry and the near future will undoubtedly see much wider use.

Tentative operating data on Texas Eastern's centrifugal compressors were given by B. D. Goodrich, chief engineer, in a discussion at the annual meeting of the Natural Gas Department of the American Gas Association here. Texas Eastern's use of centrifugal compressors has attracted considerable interest in the industry, and Goodrich reported performance has been "exceptionally good" considering the fact the equipment is completely new with no operating experience behind it.

The subject of Goodrich's talk was one of a broad range of economic and operating developments discussed before the several hundred gas-industry engineers and executives attending the 2-day meeting. Natural-gas conservation and production as it affects transmission companies, use of casing-head gas, long-line gas dispatching work, nitrogen removal, and pipe-line cleaning were among other problems receiving attention. A feature of the meeting was a tour of Katy field northwest of Houston Wednesday, the second day of the meeting. At Katy, Humble Oil & Refining Co. operates what is considered to be the world's largest cycling plant.

Cost Cut in Half

In his talk on centrifugal compressors, Goodrich emphasized that their installation by Texas Eastern was a special case in that much equipment which had been used for oil service in the Big and Little Big Inch systems was available for conversion to gas use by Texas Eastern. "Without these facilities, the economic application might not have been possible," he said.

The company now has 43 units in operation, and the estimated cost of installation at the former oil pump stations is $60 to $95 per horsepower, based on the anticipated system capacity of 508,000,000 cu. ft. daily. Though little time has been available to study operating costs, these, not including fuel or power, appear to be about half the corresponding cost for reciprocating equipment, he said.

Speaking on "progress in natural-gas conservation," D. A. Hulcy, president, Lone Star Gas Co., said the desire of gas pipe-line operators for a fully adequate source of gas results in their interest in seeing fields operated for maximum recovery.

Conservation Endorsed

One advantage of pooling, he said, is that wells may be more uniformly and usually more widely spaced. Wider spacing is necessary for complete development of a producing area. Hulcy said there is an obligation and a measure of self-interest on the part of gas lines to take casing-head gas under any reasonable circumstances. At the same time, he pointed out casing-head gas sources are sometimes less than ideal for gas companies, due to production variations and other factors.

Robert W. Hendee, president, Colorado Interstate Gas Co., first vice president of the A.G.A. and Natural Gas Department chairman, told the group that natural-gas demand in some consuming centers may continue to exceed supply for several years, despite the tremendous building program of the industry. Now planned, he said, are about 21,500 additional miles of long-distance lines, of which the Federal Power Commission has approved about 8,400. During 1947, he said, natural-gas sales reached about 2½ trillion cubic feet. Though industrial consumers took about 1½ trillion cubic feet, domestic and commercial customers provided some 70 per cent of the $843,454,000 in revenue.

Operating Problems Reviewed

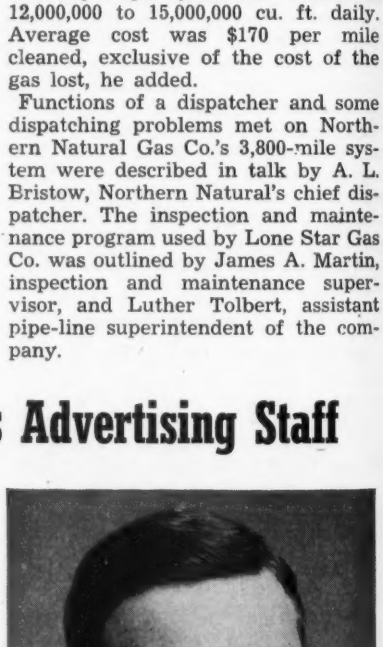
Interior cleaning of pipe lines is the way of maintaining maximum volume during the current period of heavy demand, said D. K. Stephens, superintendent of pipe lines, Panhandle Eastern Pipe Line Co. Panhandle's largest program of cleaning lines was in 1946, Stephens said, when 566 miles of main line were handled. The net gain efficiency resulted in a recovery capacity to the extent of 12,000,000 to 15,000,000 cu. ft. daily. Average cost was $170 per mile cleaned, exclusive of the cost of the gas lost, he added.

Functions of a dispatcher and some dispatching problems met on Northern Natural Gas Co.'s 3,800-mile system were described in talk by A. L. Bristow, Northern Natural's chief dispatcher. The inspection and maintenance program used by Lone Star Gas Co. was outlined by James A. Martin, inspection and maintenance supervisor, and Luther Tolbert, assistant pipe-line superintendent of the company.

D. O. Hanson Joins Advertising Staff

DONALD O. HANSON has joined the advertising staff of The Oil and Gas Journal and Petroleo Interamericano as the West Coast manager, succeeding the late J. Howard Tinkham. Hanson, whose appointment was effective May 1, has his headquarters in The Journal's California offices at 1406 South Grand Avenue, Los Angeles.

Since 1939, Hanson has been with McGraw-Hill Publishing Co. and has represented many of their publications on the West Coast. During World War II he was a lieutenant in the Navy, serving as an aircraft supply officer. He is a member of the National Industrial Advertisers Association—Southern California Chapter, the Los Angeles Electric Club, and the Illuminating Engineering Society. Hanson graduated from Stanford University in 1936 with a bachelor of arts degree. In 1938 he completed Stanford's graduate school of business with a master of business administration degree.



Hanson is married and has two children. His home is in Pasadena, Calif.

this week

TIDELANDS—House favors returning tidelands to states by overwhelming 257-29 vote. . . . Question of overriding veto still present, however, as 149 representatives miss roll call. . . . Closer vote expected in Senate. . . . Passage seen there, but probably with majority insufficient to override veto. . . . Applications for permits for offshore work and other negotiations point to increasing tempo in Gulf of Mexico activity by major companies. . . .

INTERNATIONAL—Arabian American Oil Co. issues "white paper" refuting charges of Sen. Owen Brewster. . . . Secretary of Navy Sullivan issues statement saying Brewster committee falsely assumed Navy was offered oil for 40 cents a barrel. . . . Middle East oil, he says, even with contracted increase in price, costing less than half as much as Gulf Coast and Aruba oil. . . . ¶Shutdown of indefinite duration seen for 90,000-bbl. Haifa refinery, closed since April 12. . . . ¶Creole Petroleum Corp. production again establishes new all-time high with March output of 636,063 bbl. daily. . . . ¶W. S. S. Rodgers confirms Texaco-Pemex negotiations. . . . Contract announcement expected soon. . . .

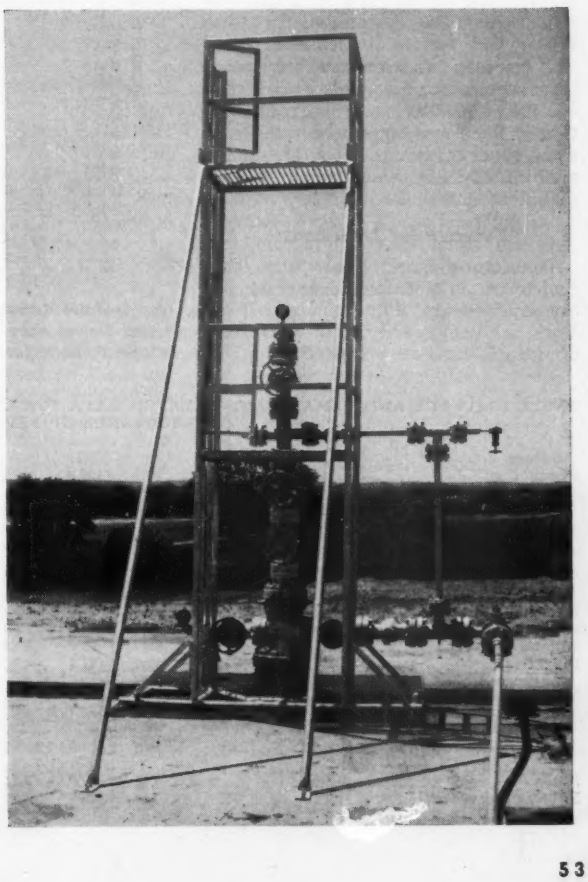
CONTROLS—Interior Department recommends presidential authority to impose priority allocation, rationing, and inventory control on oil industry. . . . Steel industry included in recommendation in order to guarantee to oil industry steel needed for production, refining and transportation. . . . Prompt synthetic-fuels development and expansion of Middle East production also recommended.

NATURAL GAS—Final report on natural-gas investigation by FPC issued by Commissioners Smith and Wimberly. . . . ¶Southern Natural Gas Co. contracts to increase its purchase price of Gwinville field, Mississippi, gas by 1 1/2 cents per 1,000 cu. ft. . . . ¶Operating revenues of natural-gas companies show 12.1 per cent gain over the same month a year ago. . . .

REFINING—Sunray Oil Corp. refinery at Allen, Okla., sets record run of 170 days for Dubbs thermal cracking unit. . . . ¶Sun Oil Co. plans $16,000,000 expansion of refinery at Toledo within next 2 years. . . . ¶Socony-Vacuum economist forecasts 1949 lube-oil demand of 147,000 bbl. daily before A.P.I. lubricating committee. . . . Military requirements to show drop, barring unexpected emergency, committee is told. . . .

PIPE LINES—Tennessee Gas Transmission Co. seeks FPC authority to increase capacity of pipe-line system to 1,000,000,000 cu. ft. daily. . . . Cost is estimated at $124,354,000. . . . ¶Stanolind Pipe Line Co. begins operations of new 82-mile loop lines increasing capacity of Slaughter, Tex.-Drumright, Okla., 16-in. crude-oil trunk line. . . . ¶Contract for two pumping stations on the Rangely, Colo.-Salt Lake City crude-oil pipe line of Salt Lake Pipe Line Co. of California is let to Pacific Pipe Line & Engineers, Ltd. . . . ¶Electronic instrument is used in detecting leak in pipe-line system near Denver, Colo. . . .

TRENDS—The slight drop in crude production the week ended May 1 does not mar the current record output. . . . During the first 4 months of 1948 crude production has averaged 5,367,000 bbl. daily, not including condensate, which is 12 per cent over the 4,801,000-bbl. daily average the first third of 1947. . . . During the past 5 weeks production averaged 5,416,000 bbl. daily, which is 1 per cent above the 1948 average and shows the trend is steadily upward. . . . ¶Well completions exceed expectations. . . . As reported in The Oil and Gas Journal's Annual Number, drillers expected to drill 10 per cent more wells, including 15 per cent more wildcats, in 1948 than in 1947. . . . During the 4 months ended May 1 total completions were 11,419, or 15 per cent over 1947; wildcats 1,813, or 21 per cent over the same part of last year. . . .



New to operations in Oklahoma is this type of christmas tree. It is on Magnolia Petroleum Co. 1 A. V. Spiers in Chitwood field, Grady County, new high-pressure pool and the fourth to be unitized under Oklahoma's unique unitization law. Four blowout preventers were used while the well was being drilled in, necessitating an 18-ft. substructure. Platform built around the christmas tree is used in running bottom-hole tests and paraffin scrapers

Lube-Oil Demand of 147,000 Bbl. Daily Forecast at A.P.I. Meeting

by Kenneth B. Barnes

THREE forecasts of importance to lubricating-oil manufacturers and suppliers were made before the spring meeting of the Lubricating Committee of the American Petroleum Institute's Marketing Division, held at the Mayo Hotel, Tulsa, April 28.

They predicted that:

1. The total demand on the United States refining industry for lubricants next year will average 147,000 bbl. daily. This may be a peak and perhaps not exceeded during the next few years.

2. Normal requirements of U. S. military forces and other federal agencies for all lubricating oils for the fiscal year 1949 will total 1,300,000 bbl. (approximately 3,600 bbl. per day). In an emergency, this requirement would probably be increased five times, and, "depending on the ability of industry to produce war material requiring lubrication, this daily consumption might reach 36,000 bbl. per day." (These figures do not include the normal civil-affairs requirements for Europe and the Pacific which are estimated to total 700,000 bbl. for fiscal 1949.)

3. Grease requirements for military service for the 1949 fiscal year will be 10,000,000 lb. Actual consumption will be greater, due to stocks of some types on hand. Requirement for civil affairs for same period is estimated at 12,000,000 lb.

Forecast for Lubricants

The total-demand figure was forecast by A. J. McIntosh, economist for Socony-Vacuum Oil Co., Inc., New York, who reviewed the U. S. Bureau of Mines figures on production of "lubricants" plus data on additives blended into oils or greases, white oils, petrolatums and absorption oils, to arrive at "total demand" figures. (See Table 1 for these and related figures.)

McIntosh's production trend and forecasts of the three major classifications of lubricant consumption—exports, domestic automotive type, and industrial—are shown in Fig. 1. Relation of industrial-lubricants consumption as correlated with the F.R.B. production index is given in Fig. 2.

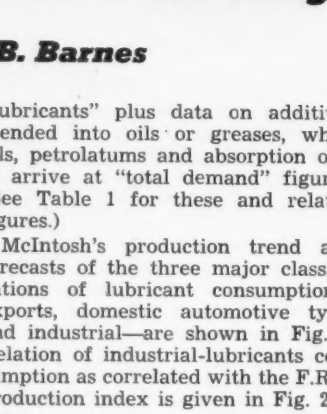


Fig. 1—Total demand for lubricants in the United States—showing exports and domestic uses (from McIntosh)

Forecasts for industrial lubricants were arithmetical computations from the trend line of Fig. 2, as based on McIntosh's conception of the business activity as measured by the F.R.B. index. McIntosh looks for a modest decline over the next few years which may end, by 1951, at about the former 1941 level. For every 10 points of difference in the forecast production as measured by the F.R.B. index, he adds or deducts about 2,000 bbl. per day for the consumption of industrial lubricants.

Motor-fuel consumption was forecast at modest increases over the next few years, but tractor fuels were shown as increasing twice as rapidly (see Table 1). A decline was forecast in the ratio of motor oils and greases to these fuel estimates. The greatly increased average age of cars and insufficient solvent treating capacity to make all the premium quality oils desired made these ratios grow rapidly during the war. However, sale of new cars and competition of the highest quality products should gradually reduce these ratios, McIntosh said, and he estimated a declining ratio over the next few years. This decline approximately offsets the requirements for additional cars.

Exports to Be Up

Demands in the foreign field from 1947 to 1951 may increase about 10,000 bbl. a day. There are available estimates for the lubricating requirements of the Marshall Plan countries, but questions have been raised as to whether those volumes may be reached. The requirements in other countries are much more speculative. McIntosh's assumption is that the lube exports will rise at about 1,000 bbl. a day during each year.

The theoretical United States lube-oil capacity which obtained in 1947 was 158,000 bbl. a day. The top month was 149,000, last May. Since then capacity has been added. McIntosh estimated the United States now can make 162,000 bbl. per day of finished and blended (including additives and miscellaneous oils) lubricants. He said

TABLE 1—SUPPLY AND DEMAND AND RELATED DATA FOR LUBRICANTS — YEARS 1940-1947 AND FORECAST THROUGH 1951. THOUSANDS OF BARRELS DAILY (McINTOSH)

Item—	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951
Production	100.5	108.3	105.8	106.0	112.3	114.7	125.1	141.8	142.8	141.9	143.9	140.8
Imports	.....	.....	.....	.....	.....	.....	0.2	0.1	.....	.....	.....	.....
Additives and miscellaneous	2.9	3.2	3.1	3.5	3.5	3.6	3.6	4.1	4.2	4.2	4.2	4.1
New supply	103.4	111.5	108.9	109.5	115.8	118.3	128.9	146.0	147.0	146.1	148.1	144.9
Stock change	+4.4	—1.8	+3.5	—4.5	+0.1	—0.1	—0.6	+2.9	.....	.....	.....	.....
Total demand	99.0	113.3	105.4	114.0	115.7	118.4	129.5	143.1	147.0	146.1	148.1	144.9
Exports	28.6	27.2	22.7	24.3	23.8	19.0	30.7	39.0	40.0	41.0	42.0	43.0
Indicated domestic consumption	70.4	86.1	82.7	89.7	91.9	99.4	98.8	104.1	107.0	105.1	106.1	101.9
Automotive type	35.5	39.0	35.2	32.6	35.3	46.0	56.7	60.1	60.3	60.4	61.0	60.2
Industrial	34.9	47.1	47.5	57.1	56.6	53.4	42.1	44.0	46.7	44.7	45.1	41.7
Motor fuel consumption	1,610.6	1,828.5	1,600.1	1,498.8	1,538.2	1,731.4	2,014.8	2,177.6	2,269.0	2,360.0	2,478.0	2,552.0
Tractor fuels consumption	39.9	38.7	40.7	40.1	43.3	40.5	44.4	47.5	52.0	56.0	62.0	66.0
Total consumption	1,650.5	1,867.2	1,640.8	1,538.9	1,581.5	1,771.9	2,059.2	2,225.1	2,321.0	2,416.0	2,540.0	2,618.0
Ratio (per cent) of motor oils to fuels	2.15	2.09	2.14	2.12	2.24	2.60	2.75	2.70	2.60	2.50	2.40	2.30
F.R.B. production index	125	162	199	239	235	203	171	187	185	175	177	160

Talking over lube-oil demand and supply problems at the Tulsa A.P.I. meeting are, left to right, Harry J. Kennedy, Continental Oil Co., Ponca City, Okla.; William M. Murray, Deep Rock Oil Corp., Tulsa; H. P. Hobart, Gulf Oil Corp., Pittsburgh; M. B. Chittick, Pure Oil Co., Chicago; Col. G. H. Vogel, Military Services Petroleum Board, Washington; A. J. McIntosh, Socony-Vacuum Oil Co., Inc., New York; and R. W. McDowell, Mid-Continent Petroleum Corp., Tulsa

it is safe to allow for about 5 per cent below maximum demonstrated capacity to get good annual average capacities, so the 162,000 bbl. figure would be reduced to 153,900 as of January 1, 1948.

Forecasts of lube-oil capacities and demands by McIntosh, compared with those of 1947, were (figures are in thousands of barrels):

Year	Total demand on U. S.	Capacity to produce (Incl. blending additives and misc.)
1947	146	*153
1948	147	158
1949	146	166
1950	148	170+
1951	145	170+

*Average for month of May, plus 4,000 additives and miscellaneous.

All of McIntosh's forecasts are based upon a continuation of general peace conditions over the coming 4 years. He reported that a careful, detailed plant-by-plant study showed that lube-plant construction during the next 2 years will add 16,000 bbl. per day more capacity to finished lubricant production.

Lubes for Armed Services

The present and future military and governmental needs for lubricants were outlined by Col. G. H. Vogel, of the Military Services Petroleum Board, Washington. The extremely high quality of the lubricating oils and greases necessary for advanced-type United States military equipment was emphasized by Vogel in a number of illustrations.

The turbo-prop engine, Vogel said, places the most stringent requirements of any aircraft power plant on a lubricating oil. This engine has the difficult turbo-jet engine-lubrication problem in the power section, with added requirements for lubricating the reduction gears which transmit tremendous power. A high-viscosity-index, low-pour-point oil (below —65° F.) is desired for lubrication of the turbo-jet and turbo-prop engines, and for the latter extreme pressure qualities are required.

Extensive research is being conducted by the military services on lubricants. Vogel said substantial improvements have been made in the development of low-temperature lubricants with decreased torque requirements at temperatures below —40° F., lower evaporation rates, and improved storage stability. The Naval Research Laboratory, after extensive research, reports that excellent low-temperature greases can be prepared from diesters, silicones, and silicone-diester mixtures, thickened with lithium stearate. These greases exhibit extremely low torques in antifriction bearings at temperatures as low as —100° F. and remarkably low evaporation rates at moderately elevated temperatures. This work led to the specification AN-G-25, a potential universal grease.

Lubrication Symposium

Four well-known engineering societies heavily interested in lubrication problems participated at the meeting in a symposium on their activities and objectives as related to lubricants and lubrication.

Paul G. Exline, Tulsa, representing the American Society of Mechanical Engineers Lubrication Coordinating Committee, said: "By calling together in open forum these societies intimately concerned with the problems of lubrication, the A.P.I. is performing a real service for the entire engineering profession."

Exline discussed the work of the A.S.M.E. in formulating a coordinating committee with a scope to include theory, properties of lubricants, methods and procedures of lubrication, application of lubricants, and other related subjects.

The American Society for Testing Materials was represented by L. C. Beard, Jr., vice chairman of the A.S.T.M. Committee D-2, New York, who said A.S.T.M. as a whole had more than 700 technical committees and in its 45 years of existence had issued some 1,400 specifications and tests aggregating more than 7,000 pages. Beard reviewed the work of Committee D-2 which has as its scope "specifications, methods of test, and nomenclature relating to petroleum, to petroleum products (including products derived in part from petroleum, and to lubricants." Beard said the 1947 edition of A.S.T.M. Standards on Petroleum Products and Lubricants listed 84 test methods and 4 specifications with 39 of the test methods applicable to lubricating oils and greases. A.S.T.M. currently has four technical committees working on lubricants.

The American Society of Lubrication Engineers was organized in Pittsburgh in the fall of 1944. O. L. Maag, Timken, Ohio, president of A.S.L.E., speaking on the objectives of the organization, said membership in the past year had grown from 507 to 1,120.

The Society of Automotive Engineers was represented by R. J. S. Pigott, Gulf Research and Development Co., Pittsburgh, president of the organization. W. M. Murray, Deep Rock Oil Corp., Tulsa, secretary of the A.P.I. Lubrication Committee, traced the development of the lubricating branch of the oil industry during recent years, showing improvements made in the quality of lubricants and the great strides made by the oil industry in supplying adequate quantities of the best quality of lubricants for all needs.

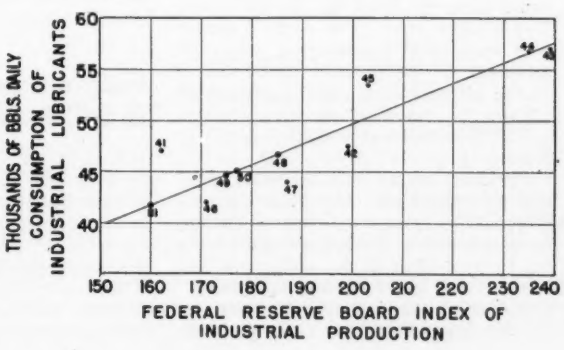


Fig. 2—Correlation between consumption of industrial lubricants in the United States and the F.R.B. industrial production index (from McIntosh). Data for the years 1918-1940 also were plotted but are not shown here. They fall off scale to the lower left

International

WORLD-WIDE OIL DEVELOPMENTS

Oil Sold U. S. Navy Based on Gulf Coast Prices, Aramco Reports

ARABIAN AMERICAN OIL CO.'S price position on crude oil and petroleum products, a matter which recently has been given particular attention by several congressional committees, was summed up by Aramco this week with the issuance of a "white paper." Aramco said:

"There never has been a posted price for crude oil or petroleum products on the Persian Gulf. There had to be some point of reference for sales from that area. That reference was and is the price on the United States gulf.

"The prices charged the U. S. Navy by Aramco and Caltex (California-Texas Oil Co., Ltd.) were never higher and often were substantially below the lowest prices for comparable products on the U. S. Gulf Coast. Moreover, Aramco and Caltex held their 1945 prices to the Navy constant during the years 1946 and 1947 when the market prices on the United States gulf and elsewhere were steadily mounting. By buying at the prices it did, the Navy saved more than $26,500,000 during the period 1942-1947, inclusive.

"There has been some suggestion that Aramco's $1.05 (per barrel) price to the Navy (for special Navy fuel oil) on its July 1945 lend-lease crude-oil contract was subject to criticism because 2 months later there were some sales to French commercial customers at 95 cents and 90 cents (per barrel). But the circumstances were quite different.

"When these French sales were made, the war, with its enormous military demand for oil, had just ended and oil men everywhere expected a glut of oil on world markets. Oil companies everywhere were reaching out competitively to establish new markets.

"The prices quoted on the French sales were introductory prices and were figured mathematically to meet those from the nearest sources of supply in South America. That is what happened in the case of these relatively small sales, which went to several customers."

Concerning charges of tax evasion, Aramco explained that this company, "by far the most important of the corporations jointly owned by the American stockholder companies," was incorporated in Delaware and last year paid the U. S. Treasury $8,000,000 on 1946 business.

As for Caltex, it was explained that this company is a subsidiary of Bahrein Petroleum Co., Ltd., and that Bahrein Island is a British protectorate. Under these conditions it was necessary for any company doing business there to be organized as a British company.

Sullivan Says Brewster Made False Assumption

WASHINGTON.—In a statement refuting Sen. Owen Brewster's charges that the Navy paid an excessive price for Middle East oil, Navy Secretary Sullivan last week accused the Brewster committee of falsely assuming that the Navy had been offered oil at 40 cents per barrel.

"I wish to make it clear," he said, "that the Navy never received in 1941 or at any other time any unconditional offer for the sale of oil at 40 cents a barrel from the Middle East. The alleged offer of 40 cents a barrel was expressly conditioned upon an advance of $30,000,000 being made to the king of Saudi Arabia, to which neither the Navy or any other agency of the Government was authorized to commit itself."

Purchase of oil from Arabian sources, he continued, "has effected considerable savings in transportation costs because of the shorter haul from the Persian Gulf to the areas in which most of the product was consumed."

Referring to Brewster's criticism of increases from the $1.05 price to $1.17½ during the third quarter of 1948 and $1.48 during the fourth quarter, Sullivan said the increase totaled about 25 per cent. "In contrast to this increase of 25 per cent, the price in the Gulf Coast and Aruba for comparable products has increased from $1.05 in October 1945 to $2.63, or approximately 150 per cent.

"In other words, the Navy is now buying oil in the Middle East at less than one-half the price oil is selling for" on the Gulf Coast and in Aruba.

Long Shutdown Seen For Haifa Refinery

Officials of Consolidated Refineries, Ltd., expect their company's 90,000-bbl. daily refinery at Haifa, Palestine, to be shut down indefinitely. The plant was forced to close April 12 after several Arabian workers had been injured by Jewish terrorists.

The Arabs told officials that unless adequate protection to and from work were provided they would, in effect, go on strike. The company, which is jointly owned by Anglo-Iranian Oil Co., Ltd., and Anglo-Saxon Petroleum Co., Ltd. (Shell), was unable to provide the requested protection.

Plans have been under way to increase the capacity of this plant to around 9,000,000 tons yearly, about 108,000 bbl. daily. The additional crude would come from Iraq's Kirkuk field, where Iraq Petroleum Co., Ltd., is building two 16-in. lines, one to Haifa and the other to Tripoli.

This has been interpreted as an important development, since this refinery provides a large part of the petroleum-products supply for the Mediterranean area.

Half of Suez Cargo Is Oil, Report Reveals

A total of 13,846,000 tons, or approximately 276,000 bbl. daily of Middle East petroleum and petroleum products was shipped through the Suez Canal during 1947, according to the canal company's annual report. This represents almost 50 per cent of the total tonnage which went through the Suez Canal last year.

Creole March Output Reaches New Record

WITH an increase of almost 10,000 bbl. daily for March, as compared with February, Creole Petroleum Corp. showed a daily average crude-oil production in Venezuela of 636,063 bbl. This compared with 626,210 bbl. daily for February, and sets a new high.

Of the March output, 473,786 bbl. came from the Lake Maracaibo area; 157,311 bbl. from eastern Venezuela; and 4,966 bbl. from Cumarebo. Refinery runs for March were only 49,901 bbl. daily compared with 70,720 bbl. daily for the previous month. Of the 49,901 bbl. daily figure, 33,904 bbl. were refined at Caripito and the remaining 15,997 bbl. daily at La Salina.

Creole brought in 25 development wells during March and three wildcat oil producers. No gas wells were reported and only one dry hole. The dry hole was in Temblador field and drilled to approximately 3,923 ft. Fields where oil producers were brought in, their average initial production, and average depth follow:

Development: Bolivar Coastal (B.C.F.) 16 wells, 565 bbl., 4,330 ft.; Quiriquire 4 wells, 590 bbl., 3,964 ft., Temblador 3 wells, 286 bbl., 3,923 ft.; Jusepin 2 wells, 169 bbl., 4,290 ft.; and Mulata 1 well, 200 bbl. (estimated), 4,802 ft.

Wildcats: Mulata 1 well, 250 bbl., 7,336 ft.; Pilon 1 well, 215 bbl., 3,892 ft.; and Quiriquire 1 well, 228 bbl., 3,755 ft.

Texaco-Pemex Deal Confirmed by Rodgers

W. S. S. Rodgers, board chairman of The Texas Co. last week confirmed the report that his company was negotiating a contract with Petroleos Mexicanos whereby Texaco would make Pemex a loan in return for the right to purchase certain quantities of crude oil.

It is believed that Pemex will use the loan, which may approximate $30,000,000, for construction of a pipe line across the Isthmus of Tehuantepec and possibly build another refinery at Salamanca. However, Pemex has already contracted with Arthur G. McKee & Co. for a 30,000-bbl. daily plant at this point. *(The Oil and Gas Journal, October 11, 1947, page 49.)*

The Pemex-Texaco contract is expected to be announced shortly.

Atlantic to Acquire Pantepec Concessions

Atlantic Refining Co. has exercised its option to purchase 50 per cent of the Venezuelan concessions held by Pantepec Oil Co. of Venezuela, C.A. The concessions cover 326,147 acres.

Pancoastal Oil Co., C.A., an affiliate of Pantepec, will soon get all Pantepec's rights under the Atlantic agreement and is to receive $2,000,000 in cash and a $500,000 credit for drilling expenses.

Atlantic has brought in oil-producing wells on the jointly owned Pelayo concession in the State of Anzoategui and at Tucupido, in the State of Guarico. Wells are capped pending completion of pipe-line construction. Stepped-up drilling operations are being carried out on Atlantic-Pantepec Tucupido concession.

TURKEY'S PRESIDENT VISITS FIRST COMMERCIAL WELL

Turkey's initial commercial wildcat, located near Diyarbakir in the Tigris Valley which swabbed 300 to 400 bbl. daily of 15°-gravity oil, is being inspected in above photo by President Ismet Inonu (center, wearing cap and military boots). Others include employes of the Drilling & Exploration Co. who did the drilling and Turkish officials. A report from Diyarbakir states that 20 wells will be drilled in a semidesert area near the strategic road from Iskenderum to the eastern frontier. (Acme photo)

International
WORLD-WIDE OIL DEVELOPMENTS

Argentina Orders Four Tankers From Holland

Four tankers of 13,500 DWT each have been ordered from Holland shipyards by the Argentina Government, according to a Reuters dispatch from Buenos Aires. Yacimientos Petroliferos Fiscales expects delivery during 1950.

The contract, with Smit Juniors at Rotterdam, is the first under the commercial agreement signed between Argentina and the Netherlands March 18.

An order for three more tankers of the same type is said to have been placed with Udo-Vallavarvet yards in Sweden for delivery between August 1949 and February 1950.

The seven tankers are to be placed in service between the oil-producing area of Comodoro Rivadavia and the port of La Plata, near Buenos Aires, where new refinery capacity is scheduled to be built.

The Argentine Government also announced that specifications are now under study for the construction, by Cammell Laird of Birkenhead, of four tankers of 18,400 DWT each, for delivery in 1951.

Recently Argentina acquired a 31,500-bbl. tanker from the United States and two cargo vessels to be used between the Comodoro Rivadavia area and La Plata, as well as two smaller vessels for river transport.

Activities of Seven French Companies Reflect Intensive Postwar Planning

by Warren W. Burns

REFINING activities of seven French companies show additional evidence of intensive postwar planning in France.

Cie. de Raffinage Shell-Berre has three refineries, one at Petit-Couronne near Rouen on the Seine River, another at Pauillac, near Bordeaux, and the third at Berre near Marseilles.

At the Petit-Couronne refinery, which had a daily refining capacity of 16,500 bbl. in 1939, most of the tankage was destroyed during the war. Equipment removed by the Germans included miscellaneous installations representing 5,200 tons of steel, or about 350 carloads. Various parts of the plant and loading facilities were destroyed by the Germans, and at the time of liberation it was impossible to operate the plant because of the lack of tanks and piping.

The Pauillac refinery, which had a prewar capacity (distillation, cracking, and reforming) of 12,000 bbl. daily, was almost completely destroyed in the August 19, 1944 bombing.

The Berre refinery, which had a prewar capacity of 13,200 bbl. daily, received but little damage during the war. At the end of 1945 the plant resumed operations. Its present daily capacity is 16,000 bbl. The Petit-Couronne refinery resumed operations in 1946 at the rate of 4,500 bbl. daily. Last year the daily capacity was 18,000 bbl., and at the first of this year it had reached 27,800 bbl. daily, a rate which will be maintained for the next 3 years. At Petit-Couronne, liquefied gases and lubricants will be manufactured in addition to gasoline, gas oil, and other products.

To Increase Capacities

Future plans for the Pauillac plant call for a daily capacity of 3,300 bbl. of asphaltic crude for several years. At Berre, the company plans the construction of new installations which, in part, will replace those destroyed at Pauillac. Daily refining capacity there is expected to be increased from 18,000 bbl. this year to 20,000 bbl. during 1949 and 1950 and to reach 47,000 bbl. daily in 1951. Annual output of lubricating oil and asphalt will remain approximately constant. Increases in capacity will affect mainly the production of gasoline, gas oil, fuel oil, and liquefied gases.

As for crude supplies, the Petit-Couronne and Pauillac refineries expect to receive around 6,500,000 bbl. a year from the Middle East and the remainder from Venezuela. The Berre plant expects to be supplied for the next 4 years as follows: 1948—3,000,000 bbl. from Middle East and 2,700,000 bbl. from the Western Hemisphere; 1949—5,800,000 bbl. from Middle East and 870,000 bbl. from Venezuela; 1950—5,800,000 bbl. from Middle East and 870,000 bbl. from Venezuela; 1951—14,400,000 bbl. from Middle East and 870,000 bbl. from Venezuela. This year, the Cia. Raffinage will have a tonnage equivalent to 22 T-2 tankers.

Societe Generale des Huiles de Petrole, an affiliate of Anglo-Iranian Oil Co., Ltd., had two refineries in 1938, the Avera plant on the Mediterranean, which had a daily capacity of 12,200 bbl., and the Courchelettes plant near Douai, in northern France, with a daily capacity of 6,700 bbl. The Avera refinery had one cracking, one topping, and one reforming unit. The Courchelettes refinery included topping, cracking, and reforming units, together with a wax-distillate unit. Both refineries processed Iranian crude.

This is the second of two stories by the author on the French refining industry. The first appeared in the April 22 Oil and Gas Journal, page 62. It presented the general over-all picture of the French industry at present and details of two refining groups. The article presented here covers the status and current plans of seven additional French companies.

These stories are based on information provided by the Chambre Syndicale des Raffineurs de Petrole, which this week announced it has published a booklet, "The Refining Industry in France," presenting a review of the entire industry. Copies of this booklet may be obtained by writing: Groupement d'Achat des Carburants, Bowling Green Postoffice Box 69, New York 4, N. Y.

L.P.G. Output to Increase

The Avera refinery suffered no war damage and resumed operations as soon as crude commenced to arrive in France after the liberation. Capacity was progressively increased from 12,200 bbl. daily to 20,000 bbl. daily this year with the vacuum distillation unit being used as a second atmospheric distillation unit. Currently installations are being built to obtain better stabilization of gasoline and to increase the output of propane and butane, as well as to increase the gasoline octane rating, which is around 60 before leading. It is hoped to complete this program before 1950.

At Courchelettes, the refinery was seriously damaged by fire and bombing. In 1940 the Dunkirk port was completely destroyed. Supplies came by tank car from Dunkirk to this plant, which is 65 miles inland. Until major reconstruction has been completed, probably in 1951, this refinery will not be in operation.

To Restore Dunkirk Plant

Before the war, petroleum products were supplied in northern France through two competitive refineries: Courchellettes and Dunkirk. The Dunkirk plant was owned by the Petrole du Nord. Both were complete refineries handling a full line of products. The Dunkirk refinery, with an 11,600-bbl. daily capacity, was destroyed by bombing and fire in 1940. The few remaining parts were dismantled and taken away by the Germans. Societe Generale des Huiles de Petrole took over the Dunkirk operations and plans to erect a 22,200-bbl. daily plant there. Lubricating distillates will be treated at Courchelettes. By 1950 it is hoped that the Dunkirk refinery will be processing 6,700 bbl. daily. Consequently, the atmospheric distillation unit at Courchelettes is being dismantled and reerected at Dunkirk. Plans for the main unit have been ordered by Lummus Co., which will supervise construction. Anglo-Iranian will supply crude oil for all three refineries.

Raffineries de la Vacuum Oil Co. S.A.F., an affiliate of Socony-Vacuum Oil Co., Inc., operated a 5,500-

bbl. daily plant before the war on the bank of the Seine, about 23 miles above Le Havre near the Standard Francaise plant. It was equipped with topping, cracking, and reforming units, lubricating-oil solvent-refining units and had a tank farm with a storage capacity of 1,402,180 bbl. Fire and bombing wrecked most of the facilities. Other parts were carried away by the Germans, notably the Duo-Sol plant, the contact dewaxing and crude distillation units, along with pumps and various other installations.

Equipment Recovered

However, on March 18, 1946, this plant went back on stream, after the restoration and transformation of the old cracking unit with a daily capacity of 3,700 bbl. Last year another distillation unit, constructed from recovered and restored material, brought the total processing capacity to 8,000 bbl. daily. From material recovered in Germany, Austria, Czechoslovakia and Poland, the following equipment is now under construction: a vacuum distillation unit; a solvent processing plant; a contact unit; two dewaxing units; and two rerun units.

Following completion of the first part of this program, which was essentially designed to resume lubricating-oil production, work will be done to improve the quality and quantity of other products. Several orders are said to have been placed already. Approximatly 10,000 bbl. a day of crude oil is being supplied from the Middle East. The company is now in a position to handle 8,700 bbl. daily in its own tankers.

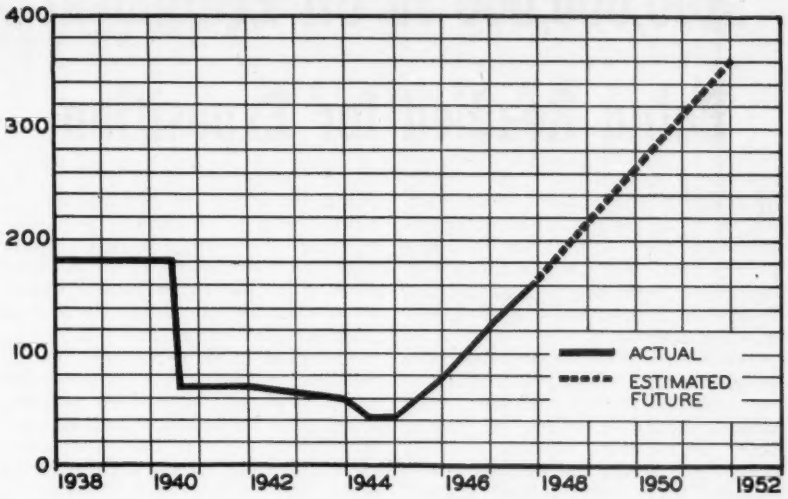
Cie. Industrielle des Petroles, another affiliate of Socony-Vacuum, was processing 5,300 bbl. daily at Frontignan on the Mediterranean. It was equipped with topping and cracking-reforming units. Spared in the first part of the occupation, some of the equipment of the Notre-Dame de Gravenchon plant was sent to Frontignan to permit the processing of lubricating oils. In 1944 many of the storage tanks were destroyed and the cracking-reformng unit severely damaged by bombings.

Operating Since 1945

Since 1945 the refinery resumed operations with the available equipment, processing topped crude to obtain lubricating oils. This plant was the only source of lube oils in France at the time. In 1947, the capacity amounted to 110,000 bbl. of lube oils and 23,000 bbl. of petrolatum.

Crude processing is to be resumed this year along with the production of lube oils at a daily rate of about 3,200 bbl. Construction of a new distillation unit also will be started this year, utilizing part of existing material with the surplus being used for a reforming unit. Next year, when it is planned to discontinue lube-oil production, the distillation unit, now being used for this purpose, will be utilized to bring the refinery's capacity up to 13,500 bbl. daily. An additional transformation is planned for this second unit which should eventually bring total output up to 16,500 bbl. daily. The company receives its crude-oil supplies largely from the Persian Gulf, carrying it in its own tankers.

French Refining Capacity (1,000 Bbl. Daily)



Raffinerie de Petrole de la Gironde, an affiliate of California-Texas Oil Co., Ltd., has a refinery at Bec d'Ambes at the mouth of the Gironde River and before the war processed 6,200 bbl. daily, turning out mostly premium and regular gasoline, kerosine, gas oil, and fuels. Following the 1944 bombings, the refinery could not be repaired. Storage facilities of about 125,800 bbl. were all that remained.

New Bec d'Ambes Refinery

Construction of a new refinery at Bec d'Ambes was authorized in October 1947. Reconstruction is now under way. *(The Oil and Gas Journal, January 15, page 47.)* The first part of the program includes the installation of a topping, reforming, and naphtha rerun plant with the necessary auxiliary facilities. A processing capacity of 13,300 bbl. daily is expected to be realized by the beginning of 1950. Arthur G. McKee & Co. is handling construction. Crude-oil supplies will come from Bahrein Island and Saudi Arabia.

Pechelbronn S.A.E.M., which had a prewar capacity of 2,900 bbl. daily at its Merkwiller refinery in northern Alsace, suffered heavy war damage. Pechelbronn is the only company in France with indigenous crude-oil production. It amounts to about 1,000 bbl. daily. Prewar production was essentially lube oils and paraffin wax, which represented 13 and 20 per cent, respectively, of French requirements. By January of 1946 the refining capacity was brought back to 1,100 bbl. daily. Monthly production of lube oils has increased from 1,500 bbl. in April 1946 to 7,500 bbl. in August of the same year. By the end of 1947 the monthly output of lube oils had been stepped up to 9,800 bbl.

Current refinery expansion calls for a daily capacity of 1,550 bbl. during 1949, a figure which may correspond with crude-oil output from the Pechelbronn fields.

Two Companies Merge

Two adjacent refineries on the north bank of the Loire River 10 miles from St. Nazaire belong to two companies which are now being merged under the name of Raffineries Francaises de Petrole de l'Atlantique. Before the war, these two plants had a capacity of 7,000 bbl. daily. The crude oil came from the United States. There was a storage capacity of 900,000 bbl. These refineries were so badly damaged during the war that they were practically useless. The only installation left was a single distillation unit. The storage capacity was reduced to 15 per cent.

By June both refineries will have been sufficiently reconstructed to regain their prewar capacity. Storage facilities have been rebuilt to 522,000 bbl. One of the refineries went on stream in March 1947 with only one distillation unit. A second unit was put on stream last June. The other refinery began its operations in February 1948.

Postwar expansion plans call for a daily capacity of 11,100 bbl. and will provide for the gradual substitution of Middle East crude for United States crude. The final phase of this program, based on needs of the economic zone supplied by these two refineries, will be to raise the output to 17,800 bbl. daily.

$100,000,000 in Oil Equipment Being Readied for Exposition

A HUNDRED MILLION DOLLARS' worth of the most modern equipment for the oil industry is being readied this week for the opening of the Silver Anniversary International Petroleum Exposition and Congress in Tulsa May 15-22.

The cream of the engineering skill of nearly 2,000 manufacturers is being crowded into the 15-acre show ground, including scores of devices never before seen, for this first oil show since before the war. More exhibitors than ever before, greater diversity of equipment, more new scientific advancements, combine to make this the largest industrial exposition ever assembled by any industry anywhere.

From the opening ceremonies Saturday morning through the 8 days and nights of the exposition the layman and the technically trained alike will find ample to interest. Wells are being drilled on the grounds by the world's largest stationary and portable rigs, machinery is in operation and in cutaway view, glass scale models of refinery and other equipment illustrate the industry's leading processes and techniques.

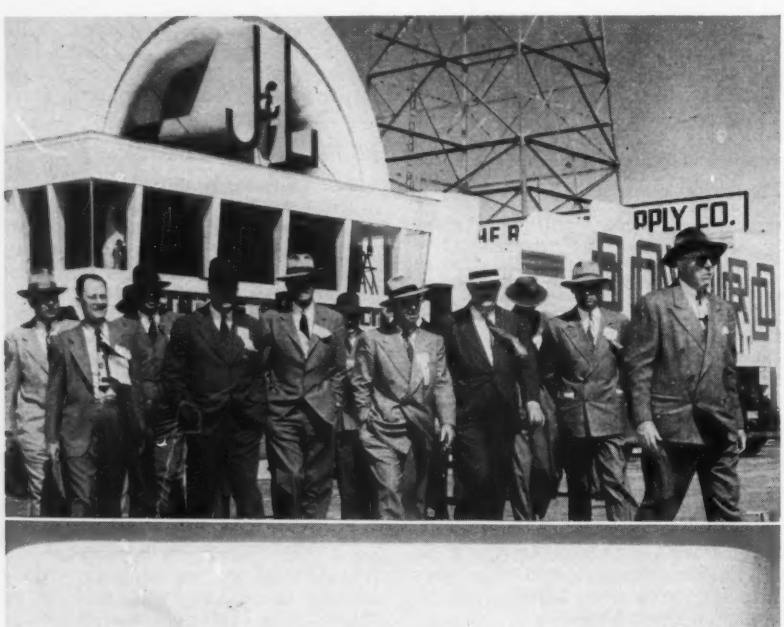
The Hall of Science, a 2-acre oil museum, shows every step in the complicated job of finding and delivery of oil by means of displays contributed by a score of oil companies, equipment suppliers, and government agencies.

The 3-day congress held simultaneously will bring speakers from many states and several foreign countries to discuss, in open forum, current problems of meeting the world's requirements for liquid and gaseous fuels.

Some 200 oil men from 20 or more foreign countries will make their headquarters at the Nomads' "International House," and a special program of entertainment is being provided for them.

"Old Timers" of the industry will make their headquarters the replica of the original Drake well, and they, too, will have their own little side show.

A gigantic truck "roadeo," with prizes totaling $2,500, will test the best drivers in the oil industry in handling heavy trucks and trailers loaded with equipment.



Top: Previews of the International Petroleum Exposition are a daily occurrence as the "World's Fair of Oil" nears readiness for its opening May 15. Here General Manager W. B. Way leads a group of Texas executives through the grounds

Bottom: "International House" is what the Nomads call their special building next to the International Petroleum Exposition office at the main entrance to the grounds. No displays, but a registry of foreign visitors and facilities for lounging and conversation will be maintained here by a greeting committee from the five Nomad chapters. Here the building is being inspected by officers of the Tulsa chapter. From left to right are W. B. Way, oil show general manager; John Pearce, manufacturers representative, chapter secretary; M. D. Gilbert, Pittsburgh Equitable Meter division, Rockwell Manufacturing Co., chapter president; J. Murray Walker, Lane-Wells Co., treasurer; H. M. Cooley, Bethlehem Steel Corp., Tulsa regent and secretary-treasurer, National Board of Regents; H. M. Cosgrove, Mid-Continent purchaser, executive secretary, National Board of Regents; K. O. Hoevel, National Supply Co., vice president, Tulsa chapter

Messenger Service At the Exposition

The telephone numbers for The Oil and Gas Journal and Petroleo Interamericano booths at the International Petroleum Exposition are:

92-1125
92-1126
92-1127

Your message, telephoned there, will be delivered speedily by our dusky messenger to any point in the Exposition. Leave these numbers at your home and office for your oil-show contact. Make use of this free service at any time!

THE OIL AND GAS JOURNAL
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Building located on Mid-Continent Drive between California and West Virginia Avenues.

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Brewster Bows Out

WASHINGTON.—The Senate special war investigating committee, which was the springboard that started Sen. Harry S. Truman of Missouri toward the Presidency, finally passed out of existence last week with one last blast by Chairman Owen Brewster of Maine against Arabian American Oil Co.

But the big question on which Brewster has based his whole probe of the company still was unanswered —Was the Government nicked more than $30,000,000 on its purchases of Middle East oil, or did it save more than $26,000,000 during the years 1942-47?

By a coincidence which might have been more than that, Aramco distributed a "memorandum of information" a few hours before Brewster handed out copies of his report to a roomful of reporters. Handily enough, the memorandum carried a rebuttal to the several charges leveled against the company by the Maine statesman, dealing with lend-lease assistance to Saudi Arabia, the Moffett offer of oil at 40 cents a barrel, the building of the Aramco refinery, sales to the Navy, and Aramco's tax payments.

One stage of the committee's investigation might be called the mystery of the missing documents. It never did locate the letter in which Moffett made the original proposal to furnish oil at 40 cents a barrel if the Government gave financial assistance to Ibn Saud, nor other records which it sought, some of which may or may not be buried in the great mass of papers turned over to the Franklin D. Roosevelt Library at Hyde Park following President Roosevelt's death.

Now that all the facts, charges, and innuendoes have been brought out, there still is no indication what will be done about the matter, if anything. Last November, Brewster wrote the Department of Justice about the allegedly excessive Aramco prices, but in the past 5 months the department has given no indication it was interested.

Jets Take Stage

WITH a big aviation development in the offing, the House interstate commerce committee is digging into the availability of jet fuel, the probable requirements of the military, and the effect of greatly increased production on other products from the same cut, principally home-heating and diesel oils.

The military program now being worked on in Congress has been given the approval of the Congressional Aviation Policy Board without any knowledge on its part of the availability of fuel for the jet-propelled planes which will become the backbone of our expanded air force.

The commerce committee's staff now is attempting to get figures on just how much fuel will be required over the next year and the possible effect of the program on consumers of other oil products.

A number of experts and oil-company officials have been asked to give their ideas to the committee in writing, and it is probable that when the study of the oil industry's material requirements is completed the question of jet fuel will be taken up.

The committee now plans to resume hearings on materials 2 weeks hence, calling as witnesses officials from the Interior and Commerce departments and winding up with representatives of the steel industry, who will be asked whether it will be possible to provide the amount of steel estimated to be necessary by the National Petroleum Council.

Coal Question Mark

THE steel industry is getting back into full production after having suffered a loss of some 1,500,000 tons through the recent coal strike, but mill managers are wondering what will happen after June 30, when the miners' present contract expires.

The 4-week mining holiday which may cost John L. Lewis and his United Mine Workers a court-imposed penalty of $1,420,000, practically used up stockpiles of reserve coal for most industries, and if Lewis and the operators fail to come to an agreement on a new contract before the old one expires, which is the normal experience, the miners again will loose their call of "no contract, no work" and go fishing. They are due to take a vacation over the first 10 days of July, anyhow, and if they don't return to work the industrial economy may be in a tight spot.

It is not only the steel men who are looking ahead with misgivings. Another interruption of coal production would affect the oil industry, the power industry, and many others, at a time when the European recovery program and military expansion needs might be zooming.

Lewis' usual strategy is to call on the operators for a new contract only a few days before the old one expires, giving them little or no time for negotiation, then calling his men out the moment the contract expires. He would like to fix his contracts so they would expire in October, when need for coal was increasing and the pressure on the operators would be heaviest, but this year he is getting the same result as a consequence of last month's tie-up.

The repeated interruptions of coal production have soured the public and industry on coal, and were it not for the fact that oil and natural-gas supplies are inadequate to stand the strain the coal industry would lose a large part of its business this year.

Re Steel

INITIAL discussions of oil-industry requirements with representatives of the steel industry have developed clearly that the estimates of the National Petroleum Council will have to be cut back sharply, but the Office of Industry Cooperation is hopeful that the reductions can largely be confined to areas where they will be least felt.

That broad statement, however, covers a host of problems besetting Clifford A. Hahn, head of the petroleum division of the OIC, whose plans to get the steel program through quickly were set back by delays in getting the council-approved estimates and critique of the Oil and Gas Division.

The estimates and report, although the former was approved by the council on April 15 and the latter then was said to be ready for signature, did not reach Hahn until April 27, it requiring 2 days for an Interior messenger to wade through the morass of Washington to the Commerce Department.

Meanwhile, over a period of weeks, Interior Secretary Krug and Commerce Secretary Harriman were engaged in an epistolary tossing back and forth of the hot potato allocating steel to the oil industry, each official determined that he wouldn't take on the job when Hahn later warned the NPC committee might well be the first easy step toward Government control. Hahn himself believes no allocation to users is necessary, since orders for much of the steel needed by the industry already are on steel-mill books.

Hahn's preliminary studies have indicated that steel requirements for production and refining stand the best chance of being met. Requirements for line pipe, especially in the large diameters, are a different story, for the big pipe takes sheet steel for which the railroad-car and the administration's expanded ship-building programs will compete. Still more liable to be cut are the estimates for

distributor and consumer equipment.

There are two unknown factors which may affect any equation worked out with the steel industry. One is the domestic military expansion program, the other the recently planned expansion of development in Mexico. The requirements of the former will be given a priority, and a lot of pressure is being exerted on the State Department to O.K. large exports of steel to Mexico.

More Blanks to Fill

SHARPEN the pencils and get out the headache pills. Another flood of questionnaires is being prettied up by Uncle Sam.

Although it won't be on anything like the scale of wartime years, the new quest for information may mean a lot of paper work for the oil and other industries.

The questionnaire is a cheap way of getting information, even though the Government pays postage both ways, for it hangs the expense of working up the data on the victim. It has long been a favorite device of bureaucrats seeking to make a showing of great activity on a limited appropriation, frequently so they can get a larger appropriation to send out more questionnaires and be considered even more active.

Reportedly, the Economic Cooperation Administration and the National Security Resources Board are thinking of building up their statistical files. Any inquiries from the former will be related to the European Recovery Program while those from the latter will deal with questions of industrial mobilization. Both are worthy causes and the two organizations are trying to operate without building up large staffs, so they don't fall into the category of self-serving bureaucrats.

Nor could the bureaucrat label be pinned on the House interstate commerce committee, which recently has made a couple of diffident dips into the water and sent out questionnaires to a limited number of industry people asking about the Wolverton bill to start a synthetic-fuel industry and, more lately, about jet fuel.

But the questionnaire fever is catching, and if a couple of agencies start sending out inquiries others are going to hear of it and think that they, too, have been neglecting their public, and the gentle stream may become a raging torrent.

Oil Export Quota Raised 38 Per Cent; Figure Less Than Half Amount Asked

WASHINGTON.—The Office of International Trade last week announced an export quota for crude and products of 13,949,000 bbl. for the current quarter, an increase of 3,798,000 bbl. or 38 per cent, over the first quarter.

Increased exports are provided for in crude, aviation and motor gasoline, and gas oil and distillate fuel, as compared with the first quarter, while reductions are made in shipments of kerosine and residual fuel.

As announced by the OIT, second-quarter exports will be limited to 1,871,000 bbl. of crude oil; 1,262,000 bbl. aviation gasoline, 5,020,000 bbl. motor gasoline, 500,000 bbl. kerosine, 3,883,000 bbl. gas oil and distillate fuel oil (including 270,000 bbl. for shipment to Curacao for eventual return to the United States as a component of blended residual fuel oil), 1,263,000 bbl. residual fuel oil, and 150,000 bbl. blending agencies.

The total quota, the OIT said, is less than half the amount established by the recipient countries as their minimum requirements, but is felt to be the maximum quantity which at this time can be made available in the light of the current domestic supply situation.

The quota does not include the requirements for the United States-occupied areas of Germany, Austria, and Japan.

In the absence of allocations for the individual countries, not yet announced, no information is available as to exports to the Western European nations participating in the European Recovery Program.

Revenue From Oil Taxes Continues Upward Trend

WASHINGTON.—Federal gasoline-tax collections in March hit a new high for that month at $41,302,275, compared with $27,578,547 in the corresponding period last year, it was reported last week by the Internal Revenue Bureau.

Lubricating oil collections also were at a high, but not record, figure of $7,019,215, compared with $4,756,138 last year, and receipts from pipe-line transportation showed a substantial gain at $1,769,787, compared with $1,071,891, the bureau report showed.

For the first three quarters of the current fiscal year, collections from the gasoline tax amounted to $360,148,834, an increase of $33,790,257 over the $26,358,577 reported for the same period a year ago. Revenue from pipe-line transportation also increased, by $1,098,597, with collections at $13,254,048 against $12,155,451, but the return from lubricating oils fell off by $3,782,680, amounting to $57,314,037 against $61,096,717.

Texaco Will Develop McColl-Frontenac Leases

The Texas Co. has signed a contract with McColl-Frontenac Oil Co., Ltd., Toronto, Canada, for an exploration and development of McColl-Frontenac leases, which cover in excess of 1,000,000 acres, in the Leduc region.

Texaco owns about 54 per cent of McColl-Frontenac's common stock. Through the new contract, Texaco would get an undivided half interest in any Leduc production, W. S. S. Rodgers, Texaco's board chairman, explained last week to stockholders.

Cities Service to Spend $145,000,000 in 1948

Cities Service Co. will invest approximately $145,000,000 during 1948 in a search for new crude-oil sources and for expansion and replacement of facilities, according to W. Alton Jones, president.

Of the total investment, about $110,000,000 will be for petroleum and natural-gas subsidiaries. The 1948 program will bring the company's expenditures for replacement and expansion to around $700,000,000 since 1931. Last year, 87 per cent of Cities Service's gross operating income was derived from oil and gas operations, the remainder having come from utility subsidiaries.

Commenting briefly on the recently signed Petroleos Mexicanos contract with his company, Jones stated that "on the basis of experience and tests to date, there is excellent reason to believe that oil will be found (in Mexico) in substantial quantities."

Oil Group Told Tax Increases Possible

More than 300 tax counselors, attorneys, and accountants of the oil industry were told last week that no new tax reductions may be expected but, instead, that "there is a possibility, if not a probability, that a raise in rates might be expected." Wesley E. Disney, Washington attorney and former Democratic congressman from Oklahoma, made the statement before the Annual Federal Tax Forum of the Mid-Continent Oil and Gas Association in Fort Worth.

Much improvement in operating methods of the Bureau of Internal Revenue must come because of the pressure from the taxpayer, George W. Mitchell, economist, Federal Reserve Bank, Chicago, said in his report to the tax representatives.

Interior Department Recommends Tight Controls on Oil, Steel

WASHINGTON.—Warning that unless drastic corrective measures are taken, the present difficult oil-supply situation "may become chronic and remain a major national problem for an indefinite period," the Interior Department has recommended to Congress the granting of President Truman's request for authority to impose priority allocation, rationing, and inventory control on the petroleum industry, as well as upon the steel industry to provide the steel needed for production and handling of oil.

In a long list of steps designed to improve the situation, the department recommended that all producing states and individual producers maintain their output at maximum efficient rate; refineries continue to maximize crude runs of kerosine and distillates; imports be kept at maximum volume, and transportation and storage facilities operated round-the-clock.

The report also called for equitable distribution by the industry and continuation of the emergency system of state coordinators and industry advisory committees.

Prompt, energetic development of a synthetic-liquid-fuels industry, expansion of governmental and private research on oil and gas, development of the submerged lands, and expansion of foreign production, particularly in the Middle East, also were suggested.

The department called for limitation of exports of crude and products to the "irreducible minimum" consistent with the national interest, and a ban on the installation of new oil-burning equipment.

Oil Union Asks 30 Cents Per Hour Wage Increase

The Oil Workers International Union (C.I.O.) and officials of the Sinclair companies are carrying on negotiations on contract terms to replace the present contract which expires July 1. Eighty per cent of 10,000 Sinclair workers have voted in favor of striking against Sinclair Refining Co. if negotiations fail to result in a favorable contract.

The union is asking for a blanket 30 cents an hour increase in addition to changes in the contract relating to working conditions.

Gulf Coast Rig Builders Given Wage Increase

HOUSTON.—Agreements providing a 25-cent hourly wage increase for rig builders have been reached by the Oil Workers International Union and 45 rig-building contractors in South Texas and Louisiana.

The increase was effective May 1 and raised the scale to $3.25 an hour for crew pushers, $3 for rig builders, and $2 for apprentices, according to A. R. Kinstley, vice president of the international union in Fort Worth. The increase affects some 325 members of the Houston local.

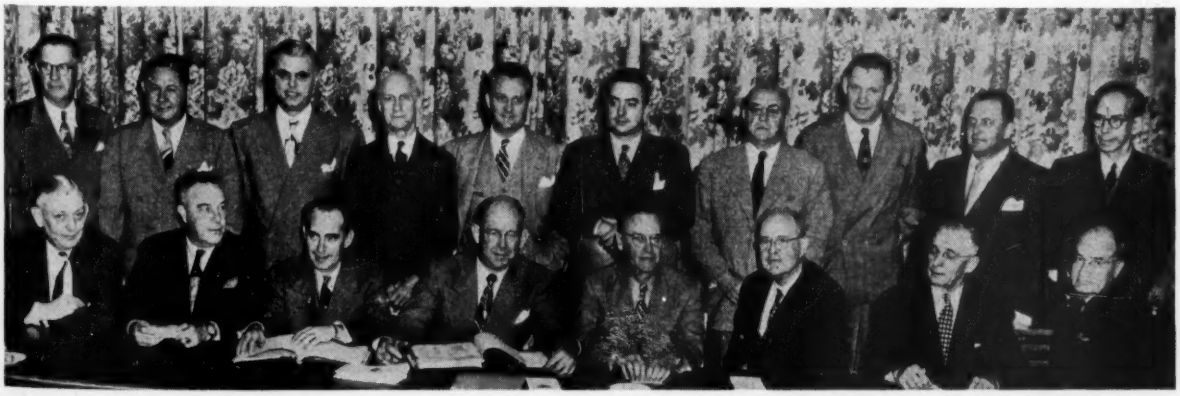
Canadian Oil Production In 1947 Exceeded 1946

OTTAWA.—Revised figures of the Dominion Bureau of Statistics show that Canada's oil production for 1947 totaled 7,729,285 bbl. against 7,606,899 bbl. for 1946. Turner Valley declined from 212,533 to 839,130 bbl.; with an from 5,937,362 bbl. of crude and 434,-210 bbl. of natural gasoline in 1946 to 5,022,350 and 427,225 bbl. in 1947. This was largely offset by 363,363 bbl. of entirely new production in Leduc and an increase of the Lloydminster production in Alberta and Saskatchewan increase in the Princess (Alberta) field from 64,953 to 106,950 bbl.

New Brunswick production was down from 28,581 to 23,128 bbl. but Ontario increased from 122,032 to 130,-135 bbl. Saskatchewan, increasing from 136,346 to 534,894 bbl., ranked next to Alberta in production. Alberta declined from 7,138,532 to 6,809,284 bbl. but the Northwest territories were up from 181,408 to 231,844 bbl.

Water Flood Operators To Meet in Independence

M. H. Stekoll, of Stekoll Petroleum Co., Independence, will lead the discussion on current practices and problems in the production of water flood projects by "flowing," at an open forum to be held at Independence, Kans., May 12. The meeting will convene at the Booth Hotel at 6 p.m. and all interested operators and personnel are invited.



Pictured here are officers of the Independent Petroleum Association of America at a session during the midyear directors' meeting at the Broadview Hotel, Wichita, Kans., April 26-27. Seated are H. B. Fell, executive vice president, Ardmore, Okla.; Russell B. Brown, general counsel, Washington; Merle Becker, president, St. Louis, Mo.; C. E. Buchner, executive manager, Tulsa; Ralph T. Zook, director and past president, Bradford, Pa.; N. T. Gilbert, treasurer, Tulsa; Thomas A. Jirik, state vice president, Faribault, Minn.; and Francis C. Wilson, executive committeeman, Santa Fe, N. M. Standing are Van S. Welch, director, Artesia, N. M.; B. A. Hardey, executive committeeman, Shreveport, La.; George H. Bruce, state vice president, Wichita, Kans.; Albert R. Jones, state vice president, Kansas City, Mo.; W. M. Vaughey, executive committeeman, Jackson, Miss.; W. H. Bird, executive committeeman, Wichita, Kans.; Dilworth S. Hager, executive committeeman, Dallas, Tex.; J. P. Jones, state vice president, Bradford, Pa.; J. E. Warren, executive committeeman, Midland, Tex.; and F. Julius Fohs, director, Houston, Tex.

PERSONALS

New California Standard Vice President Is Named

A NEWLY elected vice president of Standard Oil Co. of California is W. W. Davison, formerly general manager of the company's El Segundo refinery, a position he had held since 1944.

Davison joined Standard of California in 1921 as an engineer's helper at El Segundo after graduating from the University of California in Mechanical Engineering. The following year he became assistant chief engineer and a year later was made design engineer. In 1928 he was assigned to the manufacturing department, where he served until 1936, when he was made refinery superintendent at the Standard Oil Co. of British Columbia, Ltd., at Vancouver, B. C.

In 1940 Davison was transferred back to the El Segundo refinery as assistant superintendent and in 1943 was promoted to assistant manager. The following year he was named manager of the plant.

When attending the University of California the new vice president became a member of Tau Beta Pi, honorary engineering society. A naval aviator in World War 1, Davison now has a son who is in his first year at Annapolis.

J. B. Rogerson, formerly general superintendent for Lion Oil Refining Co., El Dorado, Ark., has been advanced to manager of manufacturing for the company, and will direct both refinery and chemical plant operations of Lion. Rogerson joined the company in 1926 and served as plant engineer, chief engineer and process superintendent before his promotion to general superintendent. **W. M. Carney,** assistant general superintendent, has been promoted to general superintendent. Carney has been with Lion for 22 years.

W. L. Harrington, with the Socony-Vacuum Oil Co., Inc., refinery at Casper, Wyo., has been appointed crude-oil purchasing agent for the Rocky Mountain region with offices in Casper.

H. F. Heath, district manager at Midland for West Texas Gas Co., will leave soon for Lubbock, Tex., where he will be superintendent of the city plants.

G. F. McNair, formerly manager of the crude oil department of Pan American Production Co. in Houston, has been named manager of the southwestern division of Central Pipe Line Co., a subsidiary of Allied Oil Co., Inc. **Leslie Paris** has been named general superintendent of operations of the southwestern division of Central. **C. H. Marshall,** who has been in charge of the tri-state division of Central Pipe, will supervise the operations of the company's southwestern division while **Charles W. Scott** is on leave of absence.

Clyde T. Foster, vice president of Standard Oil Co. (Ohio), has been elected executive vice president of the company. After serving as counsel to various oil companies, Foster joined Standard in 1929 as assistant manager of service stations. In 1935 he was made head of the operating department of the sales department and the following year became director of all sales research work. He was made assistant to the president in 1942 and in the following year was also named manager of the industrial relations department. He was elected vice president and a director of the company in 1946.

L. M. Jones, landman for the central division of Stanolind Oil & Gas Co. at Oklahoma City, has been named secretary of Stanolind Oil Purchasing Co. In addition to his secretarial duties, Jones will have general supervision over the division order department and the contract department.

Gordon H. White, manager of Shell Oil Co., Inc.'s exploration department, Midland, Tex., area, is attending a 13-week advanced management training course at the Harvard University Graduate School of Business Administration. **H. M. Fritts,** of the Houston regional office, is acting manager, at Midland, until White returns.

D. R. KNOWLTON

Don R. Knowlton, head of the Knowlton Engineering Co., Oklahoma City, has been elected president of Old Ocean Oil Co. and J. S. Abercrombie Co., Houston. He succeeds **Lloyd Noble,** who becomes chairman of the board of the two companies. Knowlton will continue to reside in Oklahoma City and remain as head of Knowlton Engineering. Actual operations of the two Houston companies will be under **Max R. Lents,** formerly assistant to the general manager and now vice president and general manager. Knowlton was with Phillips Petroleum Co. 20 years prior to April 1946 when he formed a partnership with **Frank Porter,** of Fain-Porter Drilling Co., in Oklahoma City and established Knowlton Engineering. He was national director of production for the Petroleum Administration for War until June 1944, when he returned to Phillips as manager of that company's foreign department.

J. R. Butler, former vice president and general manager of J. S. Abercrombie Co. and Old Ocean Oil Co., Houston, and **Martin G. Miller,** former assistant general manager of J. S. Abercrombie Co., have organized J. R. Butler Co., an oil and gas consulting firm with offices in Houston. The new firm is being retained by Abercrombie and Old Ocean as consultants. Butler, who at one time was with Ohio Oil Co., has served as general manager of the Cotton Valley Operators Committee and of the Haynesville Operators Committee. He is a pioneer in the operation of cycling projects and unitization programs. Miller, who graduated from the University of Oklahoma in petroleum engineering in 1934, had previously been with Stanolind Oil & Gas Co., and also served on the Cotton Valley and Haynesville Operators committees.

Philip D. Denton, formerly assistant to **Sheldon Clark,** chairman of Sinclair Oil Corp.'s executive com-

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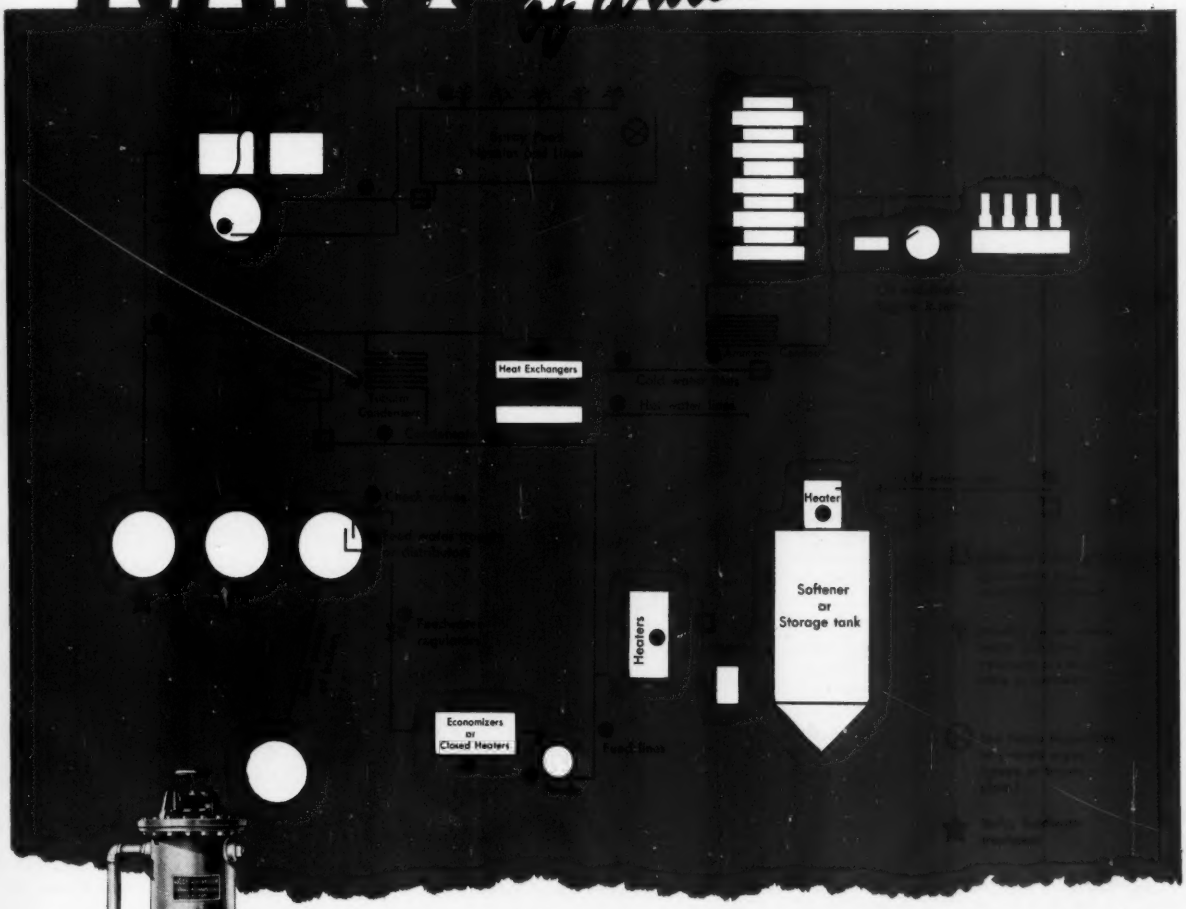
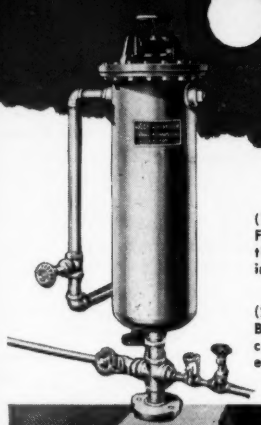
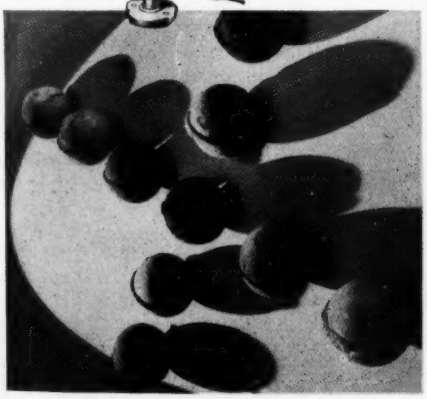




(1) Left—Nalco Ball Feeder for proportioning chemicals into the line.

(2) Below—Nalco Briquetted chemicals are safe, clean, easy to use.



. . . protects these trouble spots . . .

For continuous, successful prevention of scale, corrosion and incrustation and for control of algae throughout your plant, use the Nalco System of laboratory research, controlled chemical production, on-the-spot field service.

Nalco has developed treatments to best suit each application and maintains a continuous check-up to see that these treatments maintain maximum economy and efficiency even under changing conditions. The Nalco System is a *complete* water treatment service. Literature and details on request.

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Canadian Inquiries should be addressed to
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Nalco

PERSONALS

mittee in Chicago, has resigned to become the southern advertising representative in Atlanta for the American Weekly Magazine. Denton headed public relations for the Petroleum Administration for War's District 2.

Norman Hirschfield, vice president and director of Consolidated Gas Utilities Corp., has been elected president of the company. Consolidated Gas is engaged in the production, transportation, and distribution of natural gas in Oklahoma, Kansas, and Texas.

Martin D. Hulshizer, Mack Bell, and **W. W. Spicer,** of the drilling department of Iraq Petroleum Co., Ltd., have left New York for the Middle East.

W. E. Cannody has been named materials engineer for International Petroleum Co., Ltd., and sent to Talara, Peru.

Louis B. Kellett has joined the geological staff of Kerr-McGee Oil Industries, Inc., in its Midland division office. He was formerly with Amerada Petroleum Corp.

Frederick J. Toth, senior production engineer at Bakersfield, Calif., for Shell Oil Co., Inc., has been promoted to division production foreman at Ventura, Calif. **Leo L. Sargent,** drilling foreman at Ventura for Shell, has been transferred to Long Beach, Calif.

H. D. Moore, general sales manager of the W. T. Waggoner Estate properties, Vernon, Tex., has resigned to become executive assistant to **Dr. H. B. Alspaugh,** executive vice president of the Wood River Oil & Refining companies. Moore will be located at the Duncan, Okla., offices of Rock Island Oil & Refining Co., Inc., a subsidiary of the Wood River companies.

Robert Cowger, engineer for International Petroleum Co. of Canada, has been assigned to Peru after taking a training course with Humble Oil & Refining Co.

U. R. Laves, formerly consulting geologist at Tulsa, has joined Hubert E. Bale & Co., geologists and engineers, Oklahoma City. Before coming to Tulsa Laves did consulting work in the Seminole area with offices in Ada and Shawnee, Okla.

Theodore A. Werkenthin, materials engineer and civilian-in-charge of the rubber subsection of research and standards, Bureau of Ships, Navy Department, Washington, has been assigned additional duties as civilian-in-charge of the special fuels section of the research and standards branch.

Neil Morgan, senior petroleum production student at the University of Tulsa, has been awarded a scholarship to Pennsylvania State College as research assistant. He will study secondary recovery.

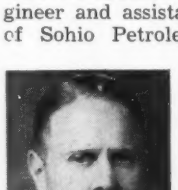
John H. Melvin, Ohio State geologist, has been named chairman of a group to study the possibility of recovering oil and liquid fuel from Ohio shale and low-grade coal. The committee is made up of nine members.

C. W. Sanders, chief geologist for Danciger Oil & Refining Co., resigned May 1 to engage in consulting work and independent operations with headquarters in Fort Worth. Before joining Danciger 4 years ago Sanders was with Shell Oil Co., Inc., for 17 years, serving in the Mid-Continent, Rocky Mountain, Gulf Coast, and California regions. He also spent 1 year in the head office at The Hague.

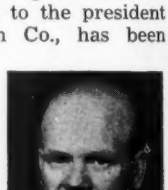
William A. Smith, holder of extensive oil properties in Texas and president of William A. Smith Construction Co., and **Charles I. Thompson,** vice president and general counsel of War Emergency Pipe Lines, Inc., during the war, have been elected directors of Texas Eastern Transmission Corp., owner and operator of the Big Inch system.

S. P. Duffield, former manager of Cia. Seaboard Dominica Petroleo, has been named drilling superintendent for Drilling & Exploration Co. and has been sent to Buenos Aires. **Robert Rose,** petroleum engineer for Drilling & Exploration Co., shortly will be made general manager of this company.

R. W. French, chief petroleum engineer and assistant to the president of Sohio Petroleum Co., has been



R. W. FRENCH



F. H. WILLIBRAND

elected vice president in charge of production operations. Previously headquartered at Oklahoma City he will be located in the main offices of the parent company, Standard Oil Co. (Ohio), in Cleveland, Ohio. **Frank H. Willibrand,** production manager in the Mid-Continent division for Sohio, has been elected assistant vice president and manager of production operations for the company. Formerly located in Oklahoma City, he will be headquartered in the main offices of the parent company and will report to French. **George S. Buchanan,** formerly assistant manager of land and exploration for Sohio, has been made assistant vice president and manager of land and exploration. He will be headquartered in Cleveland.

Herman A. Otto, Pat H. Cain, and **James P. Lockwood** have joined the geological department of Tennessee Gas Transmission Co., Houston. Otto formerly was a petroleum engineer with J. S. Abercrombie Co.; Cain was a petroleum engineer with Standard Oil Co. of Texas; Lockwood attended Harvard Business School after receiving his engineering degree in 1946.

Officers of the Society of Exploration Geophysicists elected at the annual meeting in Denver are E. V. McCollum, E. V. McCollum & Co., Tulsa., secretary-treasurer; Cecil H. Green, Geophysical Service, Inc., Dallas, past president; L. L. Nettleton, Gravity Meter Exploration Co., Houston, president; M. King Hubbert, Shell Oil Co., Inc., Houston, editor of Geophysics; and Andrew J. Gilmour, Amerada Petroleum Corp., Tulsa, vice president. This group forms the S.E.G. executive committee

Robert Brooke and **Frank O'Connor** have been transferred from Asiatic Petroleum Corp.'s New York office to assist **J. K. Evans,** Asiatic's Washington representative, in handling export licenses.

E. L. GHORMLEY

Edward L. Ghormley, formerly with California Research Corp., has joined the staff of **George Armistead, Jr.,** consulting chemical engineer, Washington. Ghormley, who recently completed graduate work at Massachusetts Institute of Technology, will be engaged in process and design engineering.

T. R. Statham, Magnolia Pipe Line Co., Dallas, was elected chairman, North Texas Section, National Association of Corrosion Engineers, at the organization meeting held in Fort Worth. Others named were: **J. A. Clay, Jr.,** Service Engineers, Inc., Fort Worth, vice chairman; **C. I. Sims,** consultant, Dallas, secretary-treasurer; and **L. C. Starbird,** Southwestern Bell Telephone Co., Dallas, assistant secretary-treasurer. Meetings of the section are scheduled for the last Thursday in each month, the next session being May 27 in Dallas.

L. M. Jones, division landman at Oklahoma City for Stanolind Oil & Gas Co., has been named secretary of Stanolind Oil Purchasing Co. at Tulsa.

E. E. Hunter, Humble Oil & Refining Co., Houston, and **M. J. Lasseigne,** Arkansas Natural Gas Corp., Shreveport, were reelected chairman and vice chairman respectively of the standing committee on federal taxation of the Mid-Continent Oil and Gas Association.

L. E. Ulrope, general manager of the marketing department of Esso Standard Oil Co., has been elected vice president and director in charge of marketing for the company. Ulrope is a former president of Colonial Beacon Oil Co., recently merged with Esso Standard.

L. O. Storm, Shell Oil Co., Inc., has been transferred from the Odessa division, production department, to Hobbs, N. M., and promoted to district engineer.

L. S. Wescoat, president, Pure Oil Co., has been named chairman of a newly created committee for the National Petroleum Council to study storage capacity, stock levels, and nonavailable stocks for crude oil and products. **L. F. McCollum,** president of Continental Oil Co., was named chairman of a new committee to study proposed revisions of regulations relating to sale of government royalty oil.

John F. Singleton has replaced **W. M. Parsons,** resigned, as Pure Oil Co.'s district superintendent in the Dollarhide area, Andrews County, West Texas.

Mills Cox, formerly with Mills Bennett Production Co., Houston, has been appointed manager of supply for Texas Eastern Transmission Corp. Active in the oil and gas industry for 26 years, he was at one time associated with Hunt Oil Co.

SHIFTS—

David C. Davis, geologist, Pure Oil Co., Kirtland, N. M., to Amarillo, Tex.; **Lee Dryden,** superintendent, Florance Drilling Co., Aztec, N. M., to Chickasha, Okla.; **N. P. Chesnutt,** superintendent, Southern Union Gas Co., Farmington, N. M., to Dallas, Tex.; **Wesley K. Rickel,** engineer, Amerada Petroleum Co., Roswell, N. M., to Lewistown, Mont.; **Sam A. Coggin,** geologist, Sun Oil Co., Robert Lee to Silver, Tex.

H. E. Butler, foreman, Humble Oil & Refining Co., Alvin to Monroe City, Tex.; **Burlin Freeze,** engineer, Phillips Petroleum Co., Corpus Christi, Tex., to Smackover, Ark.; **James C. Gibson,** engineer, Gulf Oil Corp., Crane to Borger, Tex.; **H. E. Treichler, Jr.,** engineer, The Texas Co., El Campo to Daisetta, Tex.; **H. D. Holland,** foreman, Sinclair Refining Co., Ft. Worth, Tex., to Duncan, Okla.; **C. W. Hardell,** superintendent, Sinclair Refining Co., Houston, Tex., to Wellsville, N. Y.

W. Ted Smith, superintendent, Humble Oil & Refining Co., Kingsville to Corpus Christi, Tex.; **Ocie L. Weir,** engineer, Jefferson Chemical Co., Inc., Port Arthur, Tex., to Adamsville, Ala.; **J. M. Meyers,** foreman, Helmerich & Payne, Inc., San Angelo to Robert Lee, Tex.; **H. O. Taylor,** superintendent, Taylor Refining Co., Victoria, Tex., to Iota, La.; **Claude L. Jones,** foreman, Shell Oil Co., Inc., Wichita Falls, Tex., to Monroe, La.; **V. O. Harris,** superintendent, Humble Oil & Refining Co., Harvey to Grand Isle, La.

Charlie Love, superintendent, Crescent Drilling Co., Inc., Monroe, La., to Prentiss, Miss.; **C. E. Miller,** engineer, Phillips Petroleum Co., Smackover, Ark., to Beaumont, Tex.; **W. R. Hertwig,** engineer, Standard Oil Co. (Ind.) Whiting, Ind., to Evergreen, Ill.; **Frederick Larsen,** engineer, California Co., Rangely, Colo., to Worland, Wyo.; **G. A. Gresham,** superintendent, Helmerich & Payne, Inc., Garden City, Kans., to Odessa, Tex.

Henry H. R. Sharkey, geologist, Carter Oil Co., Lander to Buffalo, Wyo.; **Joe Tracy Williams,** foreman, Carter Oil Co., Powell to Lander, Wyo.; **H. F. Thompson,** foreman, Atlantic Refining Co., Alva, Okla., to Wellington, Kans.; **Chester Dietrich,** foreman, Sinclair Prairie Oil Co., Shamrock to Kiefer, Okla.; **Henry Greenfield, Jr.,** geologist, Continental Oil Co., Fairfax, Okla., to Smithville, Tex.; **R. W. Schaefer,** foreman, Sunray Oil Corp., Placedo Junction to Nordheim, Tex.

Ed Peake, Creole Petroleum Corp., Maracaibo to Caracas, Venezuela; **Lawrence Code,** manager in eastern Venezuela for Creole Petroleum Corp., to Maracaibo; **Chester Babit,** Creole Petroleum Corp., to Caripito, Venezuela; **M. R. Pitman,** district superintendent for Creole Petroleum Corp., Jusepin, to Caracas; **Lloyd Summers,** Creole Petroleum Corp., Maracaibo to Jusepin; **Robert Eads,** Creole Petroleum Corp., to Maracaibo.

DEATHS

Graham D. Kendall, 40, chief geophysicist for Deep Rock Oil Corp., died May 1 in Tulsa. He had formerly served with Amerada Petroleum Corp. and joined Deep Rock in 1945 as chief geophysicist.

Swen W. Nelson, manager of the Buffalo, N. Y., office of Bailey Meter Co., died April 12.

Allan E. Goodhue, vice president and director of Chicago Pneumatic Tool Co., New York, died April 20.

J. G. Hamill, 79, drilling contractor and a partner in the firm, Hamill & Hamill, which drilled the Spindletop well near Beaumont in 1901, died May 3 in El Campo, Tex.

J. R. Bedingfield, 61, vice president and general superintendent of Wheless Drilling Co., Shreveport, died April 25 in Shreveport.

Marion M. Vick, 53, chief clerk of the engineering department of United Gas Corp. in Houston, died April 26 in Houston.

Richard W. Bailey, 34, landman and partner in the Heathman - Honaker Drilling Co., Wichita, Kans., died April 25 near Eldorado, Kans.

Compounded Power Pumps Drill 10,000-Ft. Wells

Practical Series Operation Removes Pump Limitations For Large Internal-Combustion-Engine Rigs—

by H. L. Willke and A. L. Harrington†*

TWO 10,000-ft. wells have been drilled in Matagorda County, Texas, with the pumps in parallel during the early stages of the drilling and continuously in series during the latter stages. This was accomplished with improved pump operation.

This is newsworthy, having been the first time that compounded power pumps had been practically and continuously used as a definite part of a drilling program. Even though much constructive work had been done on this problem, the drilling industry considered series operation still in the experimental stage.

These wells were drilled by Superior Oil Co. using an Ideal Type 100 rig powered by three Superior Type 6G-510 gas engines on the rig and two on the independent pump drive. One Ideal Type C-350 pump, used for the high pressure, was driven from the rig. The second Type C-350 pump, used for the low-pressure side, was independently mounted. These pumps are 7¾-in. bore by 18-in. stroke rated at 385 hydraulic horsepower output. American Blower Gyrol fluid drives were used on all engines.

*Chief engineer and †experimental engineer, Toledo plant, National Supply Co.

Air Chambers Used

Series operation was made possible by the two large atmospheric air chambers, augmented by the Gyrol fluid drives. The air chambers are 42 in. o.d. by 90 in. tall and are constructed in accordance with A.S.M.E. code for 2,500-psi. working pressure.

One chamber was located between the high and low-pressure pumps to compensate for the cyclic volumetric difference between the two pumps. The second chamber was placed in the discharge side of the high-pressure pump to alleviate pressure fluctuations. (See Fig. 1.)

Fluid drives were employed because of their flexibility, not only in the operation of the pumps, but also in hoisting and drilling. The fluid couplings contributed greatly to distributing the load between pumps, to starting and stopping the installation, and to running a single pump at reduced speeds.

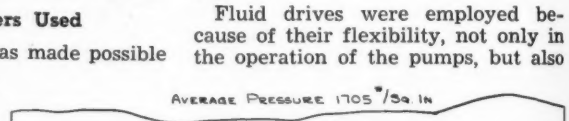
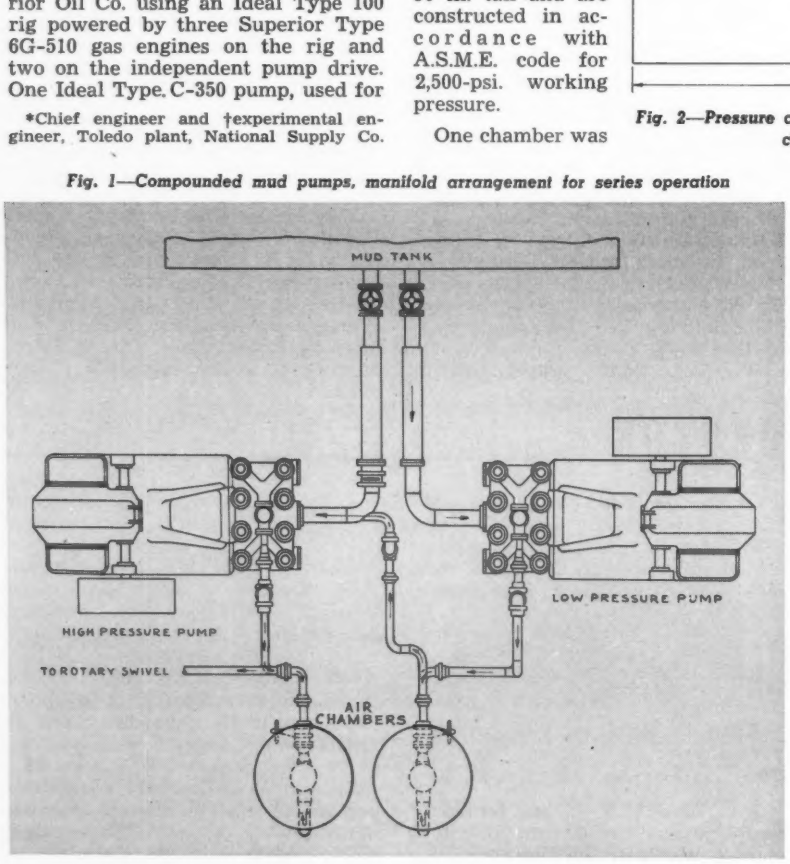

AVERAGE PRESSURE 1705 #/SQ IN
HIGH PRESSURE PUMP 45½ SPM
AVERAGE PRESSURE 885 #/SQ IN
LOW PRESSURE PUMP 47 SPM
ATMOSPHERIC LINE
ONE REVOLUTION

Fig. 2—Pressure card with pumps operating in series (using air chambers). Drilling at 9,000 ft.

Fig. 1—Compounded mud pumps, manifold arrangement for series operation



Operational procedure on going into series was simple and involved little change in routine. It was only necessary that the low-pressure pump be started first. The low-pressure pump drive clutch was engaged and the engine throttle advanced. The air chambers acted as a reservoir permitting the same operator to engage the clutch on the high-pressure pump drive before the full load came onto the low-pressure pump. The two pumps then operated in unison and attained maximum speed for a given throttle setting.

Data-Series Operation

The pumps in series produced a very even flow of mud from the chamber on the high-pressure side as shown in the pressure cards (Fig. 2), which illustrates the even distribution of load obtained. Circulation was 625 g.p.m. through 9,000 ft. of 4½-in. internal-flush drill pipe in a 9⅞-in.

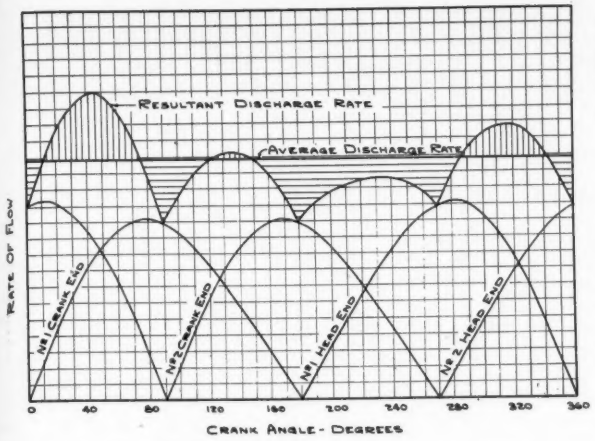

RESULTANT DISCHARGE RATE
AVERAGE DISCHARGE RATE
RATE OF FLOW
No 1 CRANK END
No 2 CRANK END
No 1 HEAD END
No 2 HEAD END
0 40 80 120 160 200 240 280 320 360
CRANK ANGLE - DEGREES

Fig. 3—Characteristic rate-of-flow curve for duplex double-acting pump

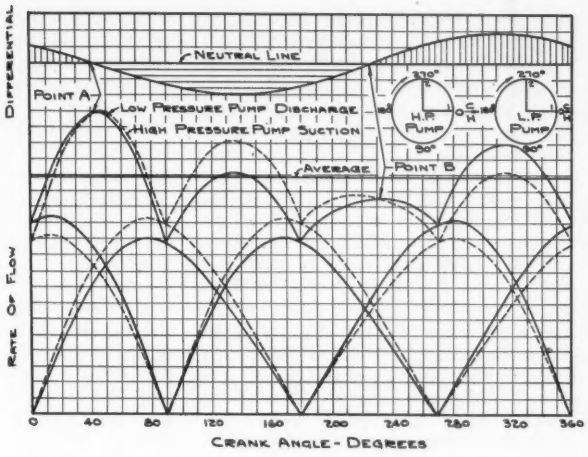


Fig. 5—Differential curve of phase 1 operation

hole with a return velocity of 3.30 ft. per second in the annulus.

During the latter stages of the drilling, pressures as high as 2,200 psi, were attained to break circulation and some drilling was done at 2,000 psi. For continuous drilling at the greater depths the circulating pressure was maintained be 1,700 and 1,800 psi. through ments of the scoops in the couplings, permitting the er be operated at full throttle.

During the drilling of thes there was no time spent by eith operator or manufacturer in the maintenance of the compounding equipment involved. In neither drilling job was any air added during the entire operation. Any tendency toward air absorption probably was offset by entrained air in the mud.

Although the need for compounding was not critical on these particular wells, the greater volumes obtained through increased pressure capacity resulted in a reduction of drilling time and a gain in bit life.

Inability to compound power pumps has been one of the serious factors in the development of larger power rigs. Most of the other rig problems have been solved through the use of modern mechanical innovations such as air ontrols and hydraulic couplings, further emphasizing the need for a solution to the pump problem.

The compounding of power slush pumps presents several interesting advantages including the following:

1. Ability to divide the total requirement into two or more pumps which are smaller and more easily transportable.
2. Flexibility in mud circulation which can be attained by paralleling pumps at the top of the hole (large volume at low pressure), and by the series operation of these same pumps at greater depths (small volume at high pressure).
3. Ability to produce fluid pressures with a minimum duty on valves and pistons due to the division of pressure load between pumps.
4. More even distribution of the load over the several engines on the rig.
5. Reduced frequency of liner changes.

Increasing interest in the development of rigs for drilling 20,000 ft. or more and in the application of internal-combustion power to this work has made the problem a critical one. Some of the hole programs considered for such wells involve 1,500 to 3,000 hp. for mud circulation. Many major operators have reluctantly abandoned consideration of power rigs for deep drilling due to pump limitations.

Some progress has been made in increasing the ratio of pump output to weight by an increase in rotational speeds and by new designs. However, this has introduced new problems and even the most optimistic approaches do not contemplate the building of single units of 1,500 to 3,000 hp.

The recognized need for series operation of power pumps gave National Supply Co. engineers added incentive toward finding a solution to this problem. It has been realized that compounding would require dependable and trouble-free auxiliary equipment. The application of hydraulic couplings was one of the initial steps in this direction but couplings alone did not adequately cover a wide range of conditions.

Accordingly, in 1943, a research program was initiated, involving not only a mathematical study of pump performance but also a complete laboratory evaluation of this work.

Test Work Setup

The test setup was arranged for two 5 by 10 duplex double-acting pumps and 80 hp. diesel engines. These pumps were selected because their characteristics were approximately the same as those of the large power pumps used in the field.

The effects of different types of power takeoffs were checked. These included hydraulic coupling, torque converter, and conventional friction clutch drives. Both V-belts and chains were used. The manifold was made so

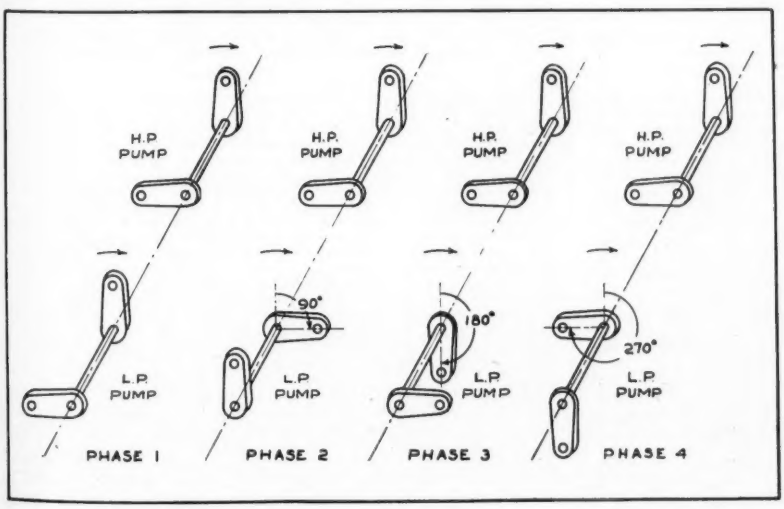


Fig. 4—Crank relationships of the high and low-pressure pumps in the four phases

that the pumps could be run singly, in parallel, or in series and with or without air chambers on the discharge of either pump.

Although considerable work has been done with precharged chambers for a period of nearly 75 years, it was felt that no existing construction was dependable. It seemed desirable to avoid the complications of chamber troubles and therefore free air chambers were chosen because of their simplicity and freedom from mechanical difficulties.

The chambers varied slightly from conventional design in that the entire pump output passed through an enlarged tubular section. The fluid velocities and inertias were thus reduced to a point where instantaneous surges could be absorbed by the chamber. As a secondary purpose the enlarged section was arranged to act as a trap for entrained air.

The air chambers selected were of more than ample size on the basis that the effective volume could be reduced by venting, permitting a check on operating charcteristics for different size chambers. The chambers were equipped with reflex liquid-level gages to measure the volume and to observe the maintenance of air.

The principal instrumentation was a hydraulic indicator that made correlated recordings of instantaneous pressures and crank positions on both high and low pressure pumps.

Before discussing the laboratory results of series operation the fundamental characteristics of a duplex double-acting pump should be discussed. These may be expressed graphically as shown in Fig. 3. The rate of flow is represented by the ordinate and the crank position by the abscissa. The resultant discharge rate is the summation of the fluid being displaced by the two pistons at any instant. The duplex double-acting pump is characterized by the four periods of variable discharge. Similar curves can be drawn for power pumps with any number of cylinders, each type having a distinctive discharge characteristic.

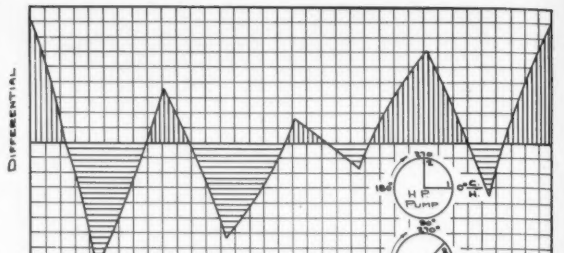


Fig. 6—Differential curve of midphase operation

Since there is a relationship between rate of flow and pressure, the discharge pressure variation is a similar curve when there is no air chamber in the line. An air chamber when used on a single pump, if sufficiently large, will transform the variable discharge into essentially a constant flow by absorbing fluid when discharge rate is above average and by discharging fluid when below.

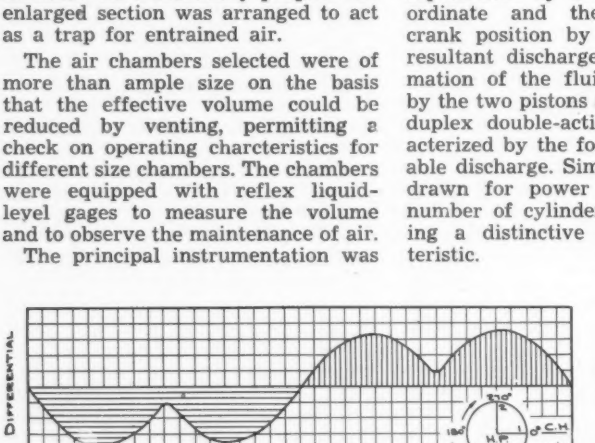


Fig. 7—Differential curve of phase 2 operation

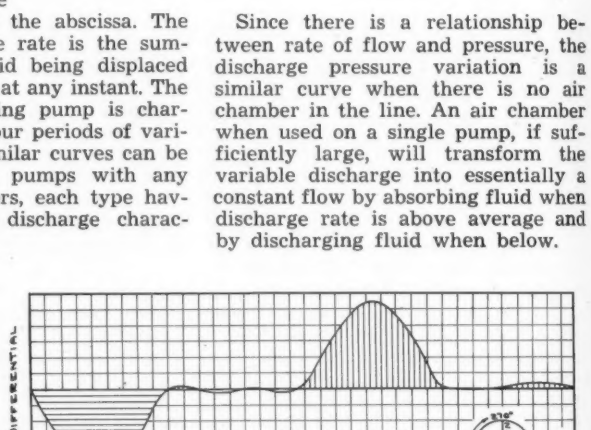


Fig. 8—Differential curve of phase 3 operation

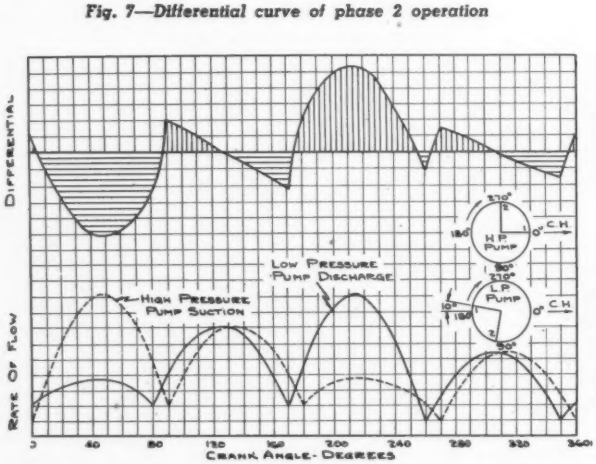


Fig. 9—Differential curve with cranks 10° out of phase 3

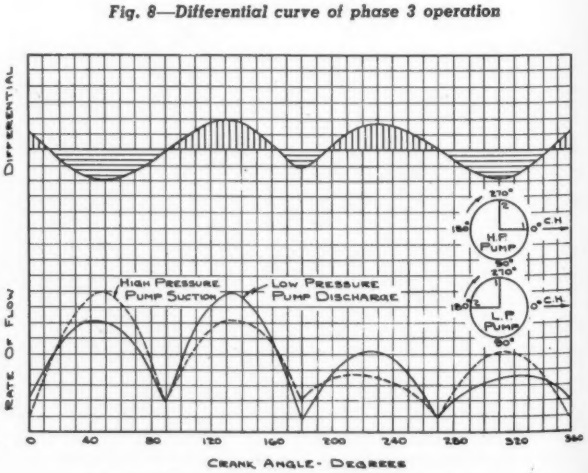


Fig. 10—Differential curve of phase 4 operation

The most interesting and enlightening portion of the compound test was in operating the pumps in series without the aid of air chambers or cushioned drives. The operation was extremely rough and it was necessary to work at reduced pressures to avoid exceeding the shear relief valve settings.

It was observed that the pumps tended to operate in unison almost as though they were mechanically connected. This condition was in fact a fairly secure hudraulic lock and existed for four relative crank positions between the two pumps. These conditions have been labeled phases 1, 2, 3, and 4 although the pumps are in true synchronism only in phase No. 1 (Fig. 4), in which the cranks of both pumps are in identical positions.

Substantially the pumps are always operating in one of the phases; however, due to volumetric efficiency differences there is a progression from one phase to another. Since the low-pressure pump has to provide its own filling, its displacement per revolution is somewhat less than that of the high-pressure pump. Consequently, to displace the same amount of fluid it must operate at a slightly increased speed.

Phase No. 1 is the most stable and the pumps operate in this relationship approximately 85 per cent of the time. Fig. 5 reveals the theoretical fluid flow relationship between pumps in this phase in which the cranks are in true synchronism. The suction rate curve of the high-pressure pump is shown superimposed on the discharge-rate curve of the low-pressure pump and the resultant difference is a pure sine wave. Only twice in the cycle do the suction and discharge rate coincide as identified by points A and B although the displacement per revolution is the same.

The area above the neutral line is representative of a definite amount of excess volume between the pumps. In series operation without an air chamber this means that the low-pressure pump will force fluid through the high-pressure pump. In doing so, the low-pressure pump will assume full line pressure representing 100 per cent overload. An instant later the change in discharge and suction rates creates a deficiency of fluid between the pumps represented by the area below the neutral line. In this case the low-pressure pump is unable to establish a pressure on the suction side of the high-pressure pump and as a result the high-pressure pump in carrying full line pressure alone is subjected to 100 per cent overloading.

After the pumps have operated in phase 1 for a period of time the lower volumetric efficiency of the low-pressure pump will result in a sudden advancement of its cranks, relative to the crank positions of the high-presure pump, into phase 2. The phase change which occurs very suddenly is accompanied by violent fluid hammer which results from the sudden and excessive fluid surges. Peak pressures during this period will become many times as great as during normal operation and are difficult to record. Some idea may be obtained of the magnitude and celerity with which these surges occur from Fig. 6 which represents a theoretical interphase condition.

Phases 2, 3, and 4 similarly have characteristic discharge and suction differences which vary considerably from one another and are much less stable than phase 1. These phases represent approximately 7, 1, and 7 per cent respectively of total time. Figs. 7, 8, and 10 show the theoretical differential curves of these phases. The corresponding pressure cards are shown in Figs. 11, 12, and 13.

Once the pumps fall out of phase 1 they pass through the various phases with relative rapidity accompanied by the fluid hammer of interphase operation. The cards show the pressure swings created by the rapid development of fluid excesses between the pumps.

In some cases the magnitude of these pressure swings is increased by the action of pistons in the low-pressure pump, and may occur when a pressure is being created. The instant the pressure at the face of piston is raised above the pressure in the discharge header and the discharge valve opens an impulse travels out into the line. This impulse may coincide with the pressure swing existing in the line.

It was impossible to obtain a true phase 3 pressure card due to the continual variation of pump speed. The period of deceleration in the high-pressure pump, that is, when it is not receiving help from the low-pressure pump, is immediately followed by a period of acceleration. The reverse is taking place in the low-pressure pump. The shifting of crank relationships during each cycle amounts to several degrees. A condition slightly out of phase is the result as shown in Fig. 9. The pressure card in Fig. 12 is representative of those obtained while operating in this phase and shows the presence of four pressure peaks during a cycle.

Phases 2 and 4 (Figs. 7 and 10), are easily identified. Good correlation was obtained between the theoretical differential curves and the pressure cards. An interesting feature of these phases is the number of times the total load was transferred between pumps during a cycle.

The pumps lose their tendency to remain locked in phase when using chambers. The low-pressure pump runs uniformly at a slightly greater speed, depending upon the volumetric efficiency.

From the curves it can be seen that the function of the air chamber is to make the discharge rate of the low-pressure pump conform to the variable suction requirements of the high-pressure pump. The air in the chamber is compressed by the fluid when the rate of flow from the low-pressure pump is greater than that required by the high-pressure pump. An in-

(Continued on page 108)

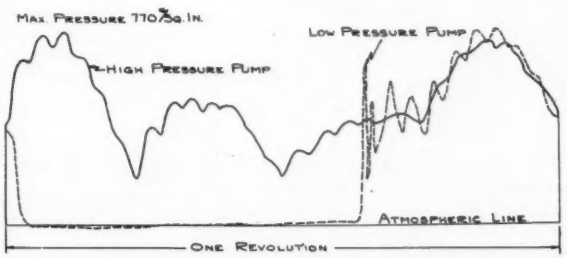


Fig. 11—Pressure recording of phase 2 operation, without air chamber

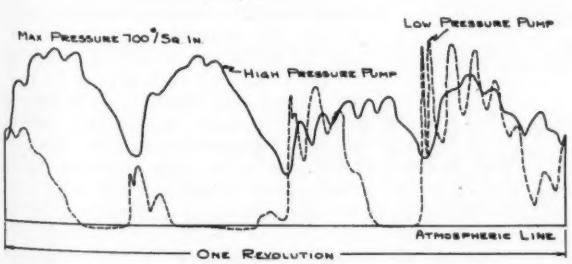


Fig. 12—Pressure recording of phase 3 operation, without air chamber

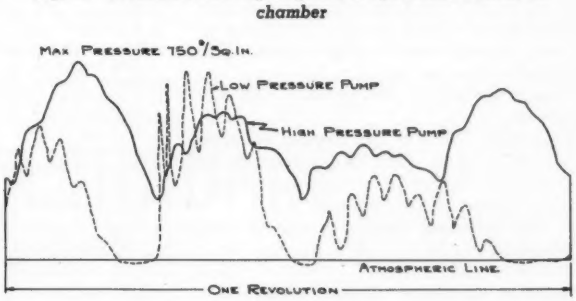


Fig. 13—Pressure recording of phase 4 operation, without air chamber

Classification and Uses of

PLASTIC COATINGS

by J. L. Robertson

PLASTIC coatings are classified here on the basis of the family or parent material, which usually conveys definite hereditary characteristics to the finished coating. The classifications give the general characteristics of each family. This offers a systematic approach to the problems of (1) evaluating the numerous available plastic coatings, and (2) selecting coatings for specific uses.

The author, associated with Phillips Petroleum Co., Bartlesville, Okla., presented the basis of this paper at the Mid-Continent District A.P.I. meeting held last month at Wichita.

WHAT is meant by the term "plastic coating"? Webster has defined "plastic" as "any of a large group of **organic** materials, synthetic or not, that are molded or cast and used variously." Consequently when the term plastic coating is used here, it is used to mean an "organic" coating.

Most people think of plastics as something new, but many plastics have been in use for years, such as the nitrocellulose lacquers used on the early automobiles. The sudden advertising value of the word plastic has caused some manufacturers to label their coating as such, and to depend on the word plastic to sell their coating.

Plastic coatings have been offered under many trade names.

It would require much time and work to test the thousands of trade-name coatings, so why not classify the coatings by families and learn the characteristics of each family? The families are based on the parent material, which usually conveys definite hereditary characteristics to the finished coating.

Table 1 shows some of the families which are most commonly used in coatings. This list is the basis for a relatively simple classification.

TABLE 1—COMMON FAMILIES OF COATINGS

1. Alkyd
2. Drying oil type
3. Cellulose
4. Phenolic, heat reactive
5. Phenolic varnishes
6. Asphalt and coal tar
7. Vinyl

The first family in Table 1 is the **alkyd** group, which might be associated with the word "glyptal." It might be known as the "work horse" of industrial painting because modifications of this family are used quite widely for industrial maintenance painting and for factory finishing of cars, trucks, and refrigerators. The alkyds are best known for their exterior durability, toughness and adhesion.

Family No. 2 is the **drying oil type** which is used quite widely on wood outdoors. Ordinary house paints usually belong to this family.

The **cellulose** family is one of long standing. It dates back to the days when nitrocellulose lacquers were used on carriages. Cellulose nitrate is highly inflammable. Later members of the same family, known as cellulose acetate and cellulose aceto esters, do not have this characteristic. Cellulose acetate has been used in formulating dopes for fabric control members of aircraft. The cellulose lacquers are used principally where fast-drying finishes are required.

Families No. 4 and 5 are **phenolics**, which often are associated with the word Bakelite.* Heat-reactive phenolics are noted for their chemical inertness. They are used for the interior of tank cars and other processing tanks which can be baked inside.

The phenolic varnishes will air dry without baking, and they are used in many places where a water-resistant finish is required. The Army has used a phenolic varnish pigmented with zinc dust, which was applied on the interior of storage tanks for drinking water.

Family No. 6 is the familiar **asphalt** group. It is commonly used for underground pipe coating. **Coal tar** is another one used extensively for underground pipe coating. Asphalt and coal tar are usually applied in a thick film, which distinguishes them from other common families of coatings.

No. 7 is the **vinyl** family which is probably the newest of all. It is noted for chemical inertness and is used quite widely for interior of tanks. Several members of this family are being used at present by oil companies to reduce interior corrosion in stock tanks and pipe-line tanks, particularly in West Texas.

List of Considerations

The most important things to know about each family are listed in Table 2.

TABLE 2—CONSIDERATIONS FOR ANALYZING EACH PLASTIC FAMILY

1. Drying method
2. Application
3. Method or film formation
4. Pigment of filler
5. Sunlight resistance
6. Water resistance (immersion)
7. Not resistant to:
8. Dried film soluble in:
9. Temperature limit (continuous exposure)
10. Hardness
11. Elasticity
12. Adhesion to steel
13. Special advantages

The **families** in Table 1 and the selection considerations in Table 2 have been combined to make the classification identified as Table 3. An even more detailed classification is given in Table 4, where the families have been divided into two main groups: (1) those which require baking, and (2) those which can be air dried. The list of families which can be made into air-dry coatings is considerably longer than the list of baked coatings.

*Bakelite is the registered trade name of a product of Bakelite Corp.

Several comments can be made on air dry coatings which dry by simple evaporation (listed as subhead 1 under Class B of Table 4). During the war ethyl cellulose was used as a dip coating for many small machine parts which were shipped overseas. When ready for use, the coating was stripped from the part.

The cumarone indene lacquers are actually a product made from coal tar, but they have been elevated socially to another family because the resins are clear and not black like ordinary coal tar. They can be pigmented and made into many colors like ordinary paints.

The rubber lacquers consist of chlorinated rubber and synthetic rubber derivatives. Thiokol is an organic polysulfide which is unaffected by petroleum hydrocarbons and most commercial solvents. It has been adopted as an interior tank coating for gasoline service, particularly aviation gasoline.

The first classification under air dry coatings which dry by oxidation, condensation, or polymerization is "drying oils." Drying oil families are used for exterior house paints because of exterior durability on wood when properly pigmented. Linseed oil is the most common type. Others include soybean oil, tung oil, perilla oil, fish oil, and oiticica oil. Besides the natural drying oils named, there are numerous synthetic drying oils.

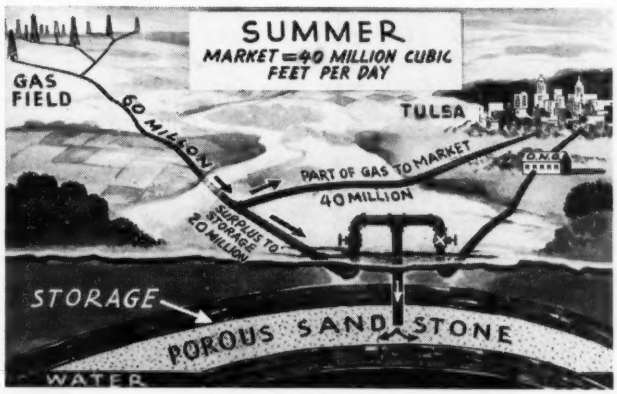
Oil-modified natural resins are a result from the marriage between drying oils and natural resins, and combine the plasticity of drying oils with the hardness and fast drying of natural resins. The result is a series of varnishes which might be called enamels when pigmented for color.

Natural resins are obtained from trees, either living or long dead and fossilized. Rosin is a specific type of resin. Rosin is a domestic product obtained from pine trees. Imported natural resins include the following: dammars, east indias, and copals.

The drying oils and the natural res-

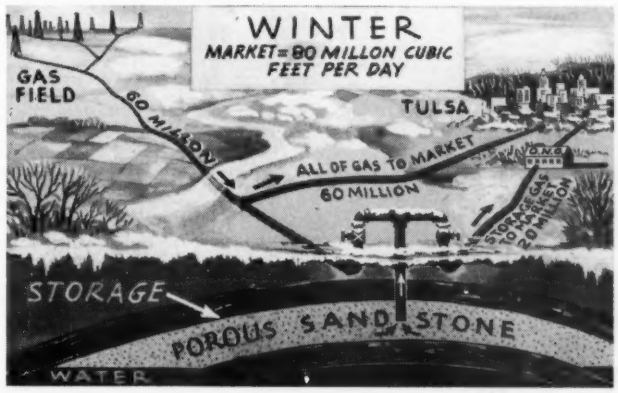
IN SUMMER WE STORE---

During summer months our gigantic underground storages enable us to store safely large amounts of distress gas which otherwise would be wasted to the open air. These storage projects, therefore, are playing an important role in the conservation of a vital natural resource and at the same time creating added security for natural gas users.



IN WINTER THERE'S MORE

During the cold season when demands for this ideal fuel reach peak proportions, this giant "backlog" of natural gas can be tapped and gas can be supplied to meet emergency and peak demands. Thus, Oklahoma Natural's underground storage system assures dependable natural gas service 365 days a year!



Above is artist's portrayal of how gas storage works by contrasting summer and winter loads. Figures shown are purely fictitious and are used only to establish an example of the real thing.

OKLAHOMA NATURAL
Gas Company

TABLE 3—CLASSIFICATION OF COATINGS

Type	Vinyl	Phenolic (heat reactive)	Phenolic varnishes	Modified alkyd	Cellulose	Asphalt and coal-tar enamel	Drying oil type paints
Drying method	Air dry or bake	Bake	Air dry	Air dry or bake	Air dry	Air dry, or hardens by cooling	Air dry
Application	Spray, brush roll coat, or dip	Spray or dip	Spray, brush, dip	Spray, brush, dip	Spray or brush	Brush or hot flow-on	Spray or brush
Method of film formation	Evaporation or heat fusion	Condensation and polymerization	Condensation and polymerization	Oxidation and condensation, polymerization	Evaporation	Evaporation or by cooling	Oxidation
Pigment or filler	(Depends on color)	(Depends on color)	(Depends on color)	(Depends on color)	(Depends on color)	Mica, talc, aluminum powder	(Depends on color)
Sunlight resistance	Good	Good	Light colors, yellow considerably	Excellent	Good	Poor	Good
Water resistance (immersion)	Excellent	Excellent	Good	Only fair	Fair	Excellent (thick film)	Only fair
Not resistant to:	Acetic acid, chlorinated hydrocarbons, ketones, esters, nitroparaffins	Alkali	Strong acids and alkalies	Esters, ketones, chlorinated solvents. Air-dry type does not resist alkali	Acids, alkali, certain solvents	Organic solvents	Acids, alkali organic solvents
Dried film soluble in:	Ketones, esters, chlorinated hydrocarbons, nitroparaffins	Insoluble in most of the common solvents	Softened by ketones, esters, and aromatic hydrocarbons	Softened by acids, alkali organic solvents	Ketones, esters	Toluene, xylol	Softened by acids, alkalies and organic solvents
Temperature limit (continuous exposure)	200° F.	250° to 450° F.	200° F.	200° to 350° F.	150° F.	200° F.	200° F.
Hardness	Good	Excellent	Good	Good	Good	Excellent	Soft
Elasticity	Good	Poor	Fair	Good	Good	Poor	Excellent
Adhesion to steel	Adhesion greatly improved by sandblasting and baking	Good when sandblasted	Good if clean	Excellent	Only fair	Good	Good
Special advantages	Chemical inertness. Tank interiors maintenance finishes and chemical equipment finishes	Chemical inertness. Tank interiors	Moisture resistance	Exterior maintenance paint	Fast drying exterior finish for manufactured oil-field equipment	Underground pipe coating	Exterior maintenance paint. Ease of application

ins we have talked about may be combined in many ways and in different proportions to form the four general families of oil modified natural resins listed in Table 4. The term "long oil" simply means that the proportion of oil is high in relation to the resins. Mixtures of oil and varnish are commonly used in metal primers for corrosion resistance when properly pigmented; that is, when an inhibiting pigment like red lead or zinc chromate is used.

Next are the oil-modified alkyd resins, which are gradually taking over much of the work done by the previous family of oil-modified natural resins. This family is just like the previous one except that alkyd resins have replaced the natural resins. If the word alkyd is new to you, it might be easier to think of the words "glyptal" or Dulux,* which are common types of alkyds.

Alkyds are usually made by the combination of glycerin and phthalic anhydride, which explains the origin of the spelling glyptal. Generally this family is tougher and more durable than the previous one, although contradictions may be found among some of the individual members of the families. The subdivisions are very similar to the preceding family.

All the members of Family 3—air dry coatings which dry by evaporation and coalescence—are types of water emulsions. Casein paints are probably the oldest type. Their typical use is flatwall interior house paints and their outstanding property is low odor and one-coat hiding.

The original casein paints were not washable; they could be removed by scrubbing with water. Oleoresinous caseins are also used for flatwall paints; they possess better water resistance.

Alkyd emulsion paints are now widely sold and widely advertised as interior flatwall housepaints for walls and wall-papered surfaces. They also have low odor, the ability to hide in one coat, and resistance to scrubbing.

Asphalt emulsions and coal-tar emulsions are both used as metal protective coatings because of their water resistance after the coating has dried. The asphalts are usually soluble in petroleum hydrocarbons and the coal tars are usually soluble in aromatic hydrocarbons.

It is advisable to assemble coating information and have it readily available when specific coating problems arise. For example, suppose we are asked for a recommendation on paint for some specific equipment in field where corrosion has been a problem. We first determine the service conditions such as: temperature, whether exposed to sunlight, whether the exposure is immersion or atmospheric, what the corrosive agents are, whether appearance and decoration is a fac-

*Trade name of a product of du Pont de Nemours & Co.

tor, etc. Then we consult the coating classification chart and pick out one or more families which might serve the problem. If the coating job is one of magnitude and considerable investment, we consult with reliable manufacturers of the type coatings which might perform successfully.

Economic considerations will sometimes eliminate the more expensive coatings. If we have had no previous experience with the particular service conditions or the manufacturer's coating, we sometimes make laboratory tests to determine any weak-

TABLE 4—CLASSIFICATION ON COATINGS

Type of coating and typical use—	Outstanding properties	Sunlight resistance	Water resistance	Gasoline, oil resistance	Hardness	Flexibility	Probable solvent for dried film	Estimated temp. limit, °F., continuous exposure	Special limitations
Class A—Baked coatings:									
1. Alkyd:									
(a) Oil modified alkyd—Motor-car, truck, refrigerator finishes	Exterior durability, toughness, adhesion	1	2	1	1	1-2	Difficult to dissolve	200-300	
(b) Phenolic modified alkyd—Washing-machine finish	Water resistance	2	1	1	1	2	Difficult to dissolve	200-300	
2. Phenolic:									
(a) Unmodified phenolic—Interior tank coating	Chemical and abrasion resistance	2-3	1	1	1	3	Difficult to dissolve	200-300	(*)
(b) Modified phenolic—Finish for metal office equipment	Chemical and abrasion resistance	2	2	2	1	3	Difficult to dissolve	200-300	
3. Urea formaldehyde — Refrigerator finishes when combined with other plasticizing resins	Hardness and color retention	2	2	1	1	3	Difficult to dissolve	200-300	
4. Melamine—Stove parts finishes when combined with other plasticizing resins	Color retention, heat heat resistance	2	2	1	1	2	Difficult to dissolve	300-400	
5. Acrylic ester—Clear coating for ferrous and nonferrous metals. Insulating coating for electrical parts	Resistance to abrasion, flexing, light color	2	1	2	1-3	1-3	Ketones, esters aromatic hydrocarbons	200-300	
6. Neoprene—Coating centrifugal blowers (steel)	Moisture resistance	3	1	2	3	3	Difficult to dissolve	100-200	(†)
7. Furane—Coating steel parts handling corrosive fluids	Moisture resistance	2	1	1	1	3	Insoluble in organic solvents	200-300	
8. Vinyl—Finish for chemical equipment, interior cans	Inertness	2	1	1	2	2	Ketones, esters	200-300	
9. Silicone—Stack paint	Heat resistance	2	2	2-3	2	2	Hydrocarbons	400-700	(‡)
Class B—Air dry coatings:									
1. Dries by simple evaporation:									
(a) Cellulose lacquers (often modified)									
(1) Nitrocellulose—Decorative finishes	Fast drying	1	2	2	2	3	Ketones, esters	180	(§)
(2) Cellulose acetate—Decorative finishes	Low flammability	1	2	2	2	3	Ketones, esters	200	
(3) Ethyl cellulose—Cable lacquer coating	Heat resistance and low temp. flexibility	2	1	1	3	1	Ketones, esters	250	
(4) Mixed cellulose esters—Protection of bronze statues	Ext. durability of clear coating	1	2	2	2	3	Ketones, esters	200	
(b) Vinyl lacquers:									
(1) Vinyl chloride-vinyl acetate — Interior and exterior metal or concrete tank coatings	Chemical resistance	2	1	1	2	2	Ketones, esters	200-300	(¶)
(2) Vinylidene chloride—Interior and exterior metal or concrete tank coatings	Chemical resistance	2	1	1	2	2	Ketones, esters	200-300	(¶)
(c) Bituminous paints:									
(1) Petroleum asphalt — Moistureproofing concrete underground	Ease of application, moisture resistance	2-3	1	3	3	1	Hydrocarbons	100-200	
(2) Natural asphalts—Moistureproofing concrete underground	Ease of application, moisture resistance	2-3	1	3	3	1	Hydrocarbons	100-200	
(3) Coal tar—Moistureproofing concrete underground	Ease of application, moisture resistance	3	1	2	3	1	Aromatic hydrocarbons	100-200	
(d) Coumarone Indene lacquers—Fume resistant industrial maintenance coating	Chemical resistance	2	1	1	2	2	Ketones, esters, aromatic	200-300	
(e) Rosin modified alkyd lacquers — Furniture lacquers	Hardness, clear rubbing, print resistance	3	2	2	1	3	Ketones, esters, aromatic. Also alcohols	200-300	
(f) Rubber lacquers:									
(1) Chlorinated rubber—Concrete primers and enamels	Chemical resistance, especially alkali resistance	3	1	2	3	2	Esters, aromatic hydrocarbons	100-200	(**)
(2) Synthetic rubber derivatives—Concrete enamels, fume and chemical-resistant paints	Chemical resistance	2	1	1-3	1	1	Aromatic and aliphatic hydrocarbons	200-300	(††)
(g) Phenolic dispension lacquers — Automobile primers and surfacers	Fast drying, moisture resistance	2	1	1	1	3	Ketones, esters	200-300	
(h) Acrylic ester lacquers — Clear coating for aluminum aircraft	Abrasion resistance, exterior durability	2	1	1	1	2	Ketones, esters, aromatic hydrocarbons	200-300	
(i) Polystyrene lacquers—Hardwood coating for electrical line insulators	High dielectric strength, chemical resistance	2	1	1	2	2	Aromatic hydrocarbons	200-300	(§§)
(j) Shellac—Coating for hardwood floors	Hardness	3	3	2	1	3	Alcohol	100-200	(¶¶)
(k) Thiokol—Interior tank coating	Gasoline resistance	3	1	1	3	1	Dioxene, tetrachloroethane	100-200	

(Continued on Next Page)

TABLE 4—CLASSIFICATION ON COATINGS (Continued)

Type of coating and typical use—	Outstanding properties	Sunlight resistance	Water resistance	Gasoline, oil resistance	Hardness	Flexibility	Probable solvent for dried film	Estimated temp. limit, °F., continuous exposure	Special limitations
2. Dries by oxidation, condensation or polymerization:									
(a) Drying oils—Exterior house paints	Ext. durability on wood (when pigmented)	1	2	3	3	1	Softened by solvents, but difficult to dissolve	200-300	
(b) Oil modified natural resins:									
(1) Long oil varnish—Exterior service station paints	Ext. durability	2	2	2	2	2	Softened by solvents, but difficult to dissolve	200-300	
(2) Medium oil varnish — Interior service station paints	Toughness	2	2	2	2	3	Softened by solvents, but difficult to dissolve	200-300	
(3) Short oil varnish—4-hour enamels	Hardness, fast drying	3	2	2	1	3	Softened by solvents, but difficult to dissolve	200-300	
(4) Mixtures of oil and varnish — Metal primers	Corrosion resistance (when properly pigmented)	2	2	2	2	2	Softened by solvents, but difficult to dissolve	200-300	
(c) Oil modified alkyd resins:									
(1) Long oil alkyd—Exterior service station paints	Color retention ext. durability	1	2	1-2	2	1	Softened by solvents, but difficult to dissolve	200-300	
(2) Medium oil alkyd—Interior service station paints	Toughness, adhesion	2	2	1-2	2	1	Softened by solvents, but difficult to dissolve	200-300	
(3) Short oil alkyd—4-hour enamels	Hardness, fast drying	2	2	1-2	1	3	Softened by solvents, but difficult to dissolve	200-300	
(4) Mixtures of oil and alkyd—Metal primers	Corrosion resistance (when properly pigmented)	2	2	1-2	2	1	Softened by solvents, but difficult to dissolve	200-300	
(d) Phenolic modified alkyd resin—Auto body primer surfacers	Moisture resistance	2	1	1	1	2	Softened by solvents, but difficult to dissolve	200-300	
(e) Oil modified 100 per cent phenolic—Marine and industrial maintenance paints	Chemical resistance								
(1) Long oil varnish—Marine and industrial maintenance paints	Ext. durability	2	1	1	2	2	Softened by solvents, but difficult to dissolve	200-300	
(2) Medium oil varnish—Marine and industrial maintenance paints	Toughness	3	1	1	2	2	Softened by solvents, but difficult to dissolve	200-300	
(3) Short oil varnish—Marine and industrial maintenance paints	Hardness, fast drying	3	1	1	2	2	Softened by solvents, but difficult to dissolve	200-300	
(4) Mixtures of oil and varnish—Marine and industrial metal primers	Corrosion resistance	2	1	1	2	2	Softened by solvents, but difficult to dissolve	200-300	
(f) Oil modifications of misc. synthetic resins—Depends on resin and oil	Depends on resin and oil								
3. Dries by evaporation and coalescence — Water emulsion paints									
(a) Casein—Flat wall int. house paints	Low odor, one coat hiding	3	3	2	2	2	Water	100-200	(***)
(b) Oleoresinous casein—Flat wall int. house paints	Low odor, one coat hiding	2	2	2	2	2	Ketones, esters	100-200	(***)
(c) Alkyd emulsion—Flat wall int. house paints	Low odor, one coat, plus resistance to scrubbing	2	1	2	2	2	Ketones, esters	100-200	
(d) Asphalt emulsions—Metal protective coating	Water resistance	2	1	3	3	2	Hydrocarbons	100-200	
(e) Coal tar emulsions—Metal protective coating	Water resistance	2	1	2	3	2	Aromatic hydrocarbons	100-200	
4. Hot melt coatings:									
(a) Coal tar—Underground pipe-line coating	Corrosion resistance	2-3	1	2	1-2	2-3	Aromatic hydrocarbons	100-200	
(b) Asphalt—Underground pipe-line coating	Corrosion resistance	2-3	1	3	1-2	2-3	Hydrocarbons	100-200	
(c) Grease—Interior water-tank coating	Water resistance	3	1	3	2-3	1-2	Hydrocarbons	100-200	
(d) Waxes—Moistureproof sealing of electrical parts	Water vapor resistance	3	1	2	1-2	2-3	Aromatic hydrocarbons	100-200	

Note: 1 = Good. 2 = Fair. 3 = Poor.

*Poor resistance to alkalies. †Softened by aromatic gasoline. ‡Poor resistance to hydrocarbons. §Highly inflammable. ¶Adhesion on steel requires sand blasting. **Poor adhesion to steel unless sandblasted. ††Softened by gasoline. §§Embrittlement with age. ¶¶Poor water resistance. ***Poor resistance to washing or scrubbing.

nesses which might influence field service. Thus we go through a gradual screening process which narrows down the number of coatings which could be used for specific problems.

If there are a number of field units to paint and if the maintenance will extend over a period of years, it might justify the application of several test coatings in the field, followed by observations on performance.

The selection of proper materials is only the first step in a successful coating job since three other factors must also be considered. C. F. Rassweiler,* associated with the du Pont company, has pointed out that the successful protection of steel with organic coatings requires careful attention to the following four factors: (1) selection of material; (2) surface preparation; (3) correct application; (4) adequate film thickness.

The surface preparation, correct application, and adequate film thickness are equally as important as the selection of material. They all contribute to a successful coating job.

*"Protective Coatings," twentieth annual A.P.I. meeting, November 1939.

Tubular-Goods Testing Device Gives Good Field Results

Used on Stanolind's Deep Oklahoma Producer

by Leigh S. McCaslin, Jr.

A NEW instrument for tubular-goods inspection has given good results during its initial field tests which include 5 months' use on Stanolind Oil & Gas Co. 1 Briscoe Unit (Grady County, Oklahoma), now completed for possibly the world's deepest producing oil well.

This new development, dubbed the Sclerograph, operates on magnetic and ultrasonic principles and is designed for the testing of drill pipe, tubing, casing, and other tubular equipment. It will determine the tensile strength of tubular goods and also locate slag intrusions, laminations, and holes.

On the Stanolind well the Sclerograph was used during diamond-coring operations below 14,000 ft. to inspect the core barrel, subs, backoff joint, and the first two joints of drill pipe above the drill collars. The testing of this equipment was done on every trip out of the hole. As a result of this inspection four fractured and two soft-metal core barrels were removed from the string. The two soft-metal barrels were found before being run into the hole for the first time. One bad joint of drill pipe was also found during the testing operations.

In the case of the first defective core barrel detected by the instrument, it is interesting to note that the operators of the Sclerograph were able to predict the fracture even before it was visible to the eye. The instrument indicated an abrupt change in tensile strength during a test on the core barrel. However, the operators decided to run the core barrel again as no cracks were discernible. When the pipe was pulled the next time a crack of some 14 to 16 in. had appeared in the exact spot predicted by the Sclerograph. Needless to say future warnings by the instrument as to serious cracks were heeded and the core barrels junked without another run into the hole. The importance of being able to predict a crack or weak spot before it becomes visible is obvious.

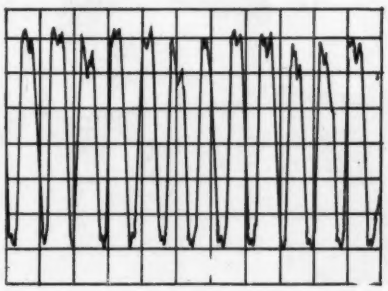
Unit Is Truck-Mounted

The Sclerograph is mounted in a standard panel-type truck for portability (see accompanying photographs). No cleaning of the pipe or core barrels is necessary prior to testing. The equipment to be tested is laid down on the board walk by the drilling crew and the three Sclerograph operators take over from that point.

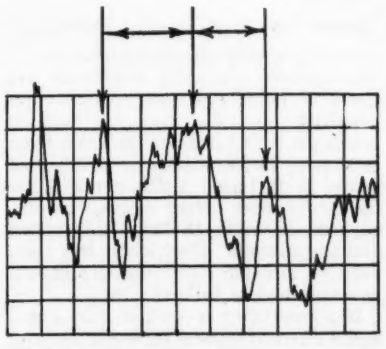
The tubular goods to be inspected are hoisted off the ground by two hand-operated mechanical jacks in order that a coil of wire known as a "conditioner," may be passed over them. After the pipe has been conditioned, pickup unit is passed over the pipe at a constant rate of speed. This unit is tied into a recording device which is mounted in the panel truck. The graph thus obtained is used by the operators to determine immediately the condition of the specimen being inspected. The entire operation consumes about 10 minutes for one joint of drill pipe. The apparatus required to perform the test can be set into operation in less than 20 minutes.

The Sclerograph will not give read-

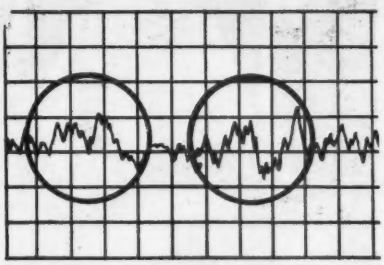
Typical Sclerograph Charts Showing Type of Information Obtained by the Recording Unit (Sections of Charts Are Actual Size)



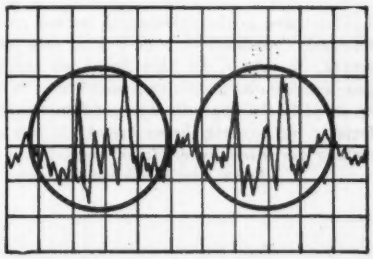
Oscillogram of the magnet groups obtained from 4½-in. drill pipe. The fact that each group is uniform in length and intensity indicates that the material is uniform in tensile strength



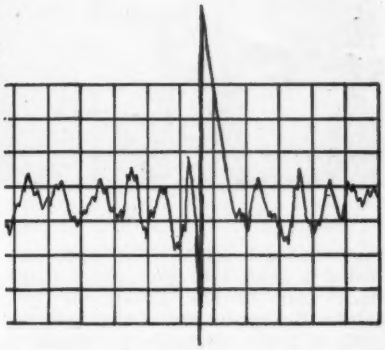
This Sclerograph chart shows a very abrupt change in structure. Length of the magnetic groups have spread at the points indicated. This indicates an increase in the tensile strength or hardness of metal. As the magnetic groups increase in length, the hardness of the metal increases and vice versa



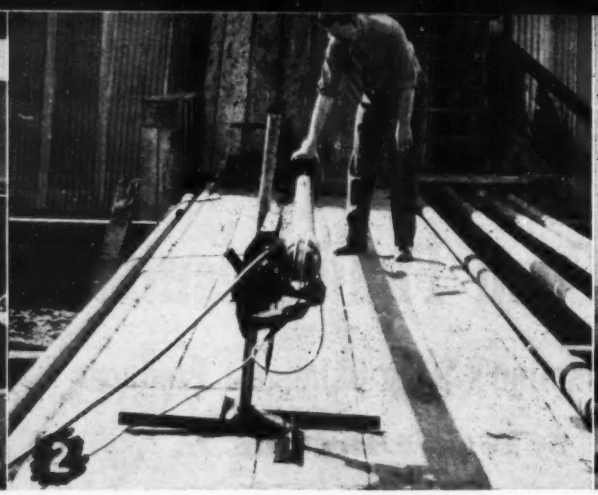
Oscillogram shows another abrupt change of structure. This chart is made from a 5-in. core barrel. After this oscillogram was taken, the barrel was run back into the hole



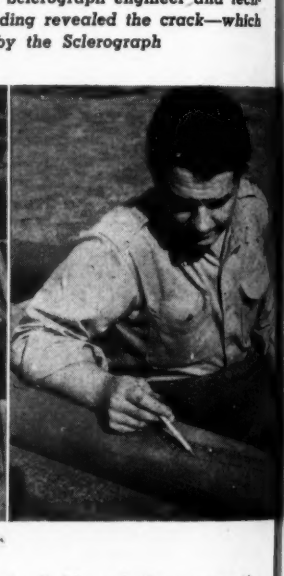
This oscillogram shows the picture after the barrel had been removed and also shows how a fracture is indicated on the charts. The barrel was fractured and the fracture was visible to the eye. The preceding chart was an oscillogram before the fracture occurred, while this chart shows the actual fracture



Showing effects of a hole in a section of 4½-in. drill pipe. In this case, a magnetic group has been broken and a strong polarization occurs at the flaw



1.—First step in the Sclerograph testing procedure is the conditioning of the tubular goods to be tested. The technician is passing electromagnetic "conditioner" over a 5-in. core barrel. (Note jack arrangement to raise pipe and permit conditioner to be passed over the barrel.) 2.—After the pipe has been conditioned, a "pickup" unit is passed the entire length at constant rate. Readings of the magnetic flux density are transmitted electrically to recording unit. 3.—Closeup view of pickup unit. 4.—Instrument panel of recording unit, as mounted in the specially equipped service truck. 5.—As soon as the record is received, it is possible to determine if there are any defects in the material being tested. In this case the chart indicated the possibility of a crack. Hence, the Sclerograph engineer and technicians are using an electrical sander to clean up the surface area for further examination. 6.—The sanding revealed the crack—which is an 8-in. break sloping some 20° from the longitudinal axis—in the exact spot predicted by the Sclerograph



ings on tool joints. The operators utilize a sonic vibration and a magnetic flux in the testing of tool joints. By sprinkling a fine powder with a high magnetic permeability on the already magnetized tool joints, defective areas are located.

Services of the new instrument are being marketed by Sclerograph Corp. with offices in Oklahoma City. Although additional uses for the instrument will no doubt develop, at present the concern is primarily interested in the problem of testing drill pipe so as to insure the contractor or operator of a serviceable string of pipe before he runs it into the hole. The record made by the Sclerograph can be used to determine if a string of pipe is usable in a particular area or whether it should be junked or used under less strenuous operating conditions.

Units other than the one used on the 1 Briscoe have been fabricated by Sclerograph Corp. and are in operation testing new and used tubing and drill pipe, and analyzing drill collars, core barrels, and inner barrels. The developers believe other potential uses of their instrument will include the testing of casing, sucker rods, and kellys.

Based on Well-Known Principles

In explaining the operation of the Sclerograph, company engineers are quick to point out that its operation involves no new theories but is based on principles which have been known to physicists for a number of years. It is based fundamentally on the Barkhouser effect which was discovered in 1919. In brief this effect and the manner in which it has been used to develop the Sclerograph can be explained as follows:

If a conductor is wound into a coil and a current passed through the coil, a magnetic force is created which is proportional to the current which it carries. If a specimen of ferromagnetic material is inserted in this coil, it will become magnetized by induction. The extent of the magnetization will depend upon the strength of the magnetic field and the magnetic permeability of the specimen.

This process of magnetication is not a spontaneous one, but according to Barkhouser's discovery in 1919, as the magnetizing force increases the elementary magnets in the material align themselves in groups. These groups form larger groups, and so on through the total length of the structure. The length of each group varies with the density of the structure; therefore, through the measurement of the group it is possible to obtain information concerning the physical properties of the material under consideration.

The Sclerograph is used to measure the intensity and length of these magnetic groups. Fractures, laps, seams, slag intrusions, or any other flaw which would represent metal parting, cause the magnetic groups to become broken, and this will be indicated on the graph. The instrument also detects variation in structure due to changes in the density of the material.

Relation of Nozzle Fluid Velocity to Rate Of Penetration With Drag-Type Rotary Bits

by J. D. Nolley, George E. Cannon, and Douglas Ragland

THIS article represents a long-range research study of drilling technique by Humble Oil & Refining Co. Observations on 26 wells in Texas and Louisiana while drilling 106,800 ft. of hole with two-bladed drag-type bits show that rate of penetration is directly proportional to the product of rate of circulation and bit nozzle fluid velocity. Maximum rates of penetration are obtained when most of the hydraulic horsepower is converted into velocity energy at bit nozzles. Simple charts are given for use with various drilling-rig assemblies.

The authors, all with Humble, presented the paper (here slightly abridged) at the Southwestern District A.P.I. meeting held last month at San Antonio.

IN the course of drilling-technique development work conducted during 1943 and 1944 with a Humble Oil & Refining Co. drilling rig in southern Louisiana, it was noted that rate of drilling with drag-type bits is roughly proportional to rate of circulation. On the basis of this work, which was conducted while drilling two 10,000-ft. wells, a survey was made of the circulating system on Humble's drilling rigs to determine the best means of circulating a maximum volume of mud with available equipment.

A logical means for circulating a greater volume of mud without adding to rig equipment was the substitution of 5-in. o.d., 19.50-lb.-per-ft., internal upset drill pipe equipped with 4½-in. internal flush tool joints[1] for the 4½-in. o.d. external upset, internal flush, 16.60-lb.-per-ft. drill pipe that was in common use at that time. As shown by test data in Fig. 1, the pressure drop per 1,000 ft. of 5-in. o.d., I.U. drill pipe equipped with 4½-in. I.F. tool joints is approximately 40 per cent less than the pressure drop through 4½-in. E.U.I.F. drill pipe.

The 5-in. o.d. drill pipe was field tested in several wells and satisfactory performance from the standpoint of all drilling requirements was obtained when used with the same sizes of holes (8⅝-in. and larger) that were drilled while using 4½-in. o.d. drill pipe. In addition to the decreased pressure drop, the 5-in. drill pipe offers 33 per cent greater torsional strength than 4½-in. drill pipe.

Humble therefore decided to equip all of their drilling rigs operating in drag-bit territories with 5-in. o.d. drill pipe as the need for replacing 4½-in. drill pipe arose.

TABLE 1—SOUTH LOUISIANA AREA—PRELIMINARY STUDIES OF EFFECT OF CIRCULATING RATE ON DRILLING WITH COMMERCIAL DRAG-TYPE BITS

Lease and well number—	Average circulating rate, g.p.m.			Average drilling rate, feet per hour		
	Single pump	Compound	Per cent inc.	Single pump	Compound	Per cent inc.
1 Sarpy Brothers: Predominantly sand, 1,400 ft.	483	596	23.4	20.6	21.7	5.3
B-3 Petit Anse Co., Inc.: Broken sand and shale, 639 ft. ...	508	567	10.6	22.1	24.1	9.0
B-7 M. Wooster: Sand and shale, 170 ft.	395	437	10.6	9.1	9.0	—1.1
2 South Texas Rice Prod.: Sandy shale, 1,046 ft.	466	634	36.0	37.7	54.7	45.0
A-30 State Land: Sand and shale, 1,027 ft.	454	517	13.8	24.0	21.6	—10.0

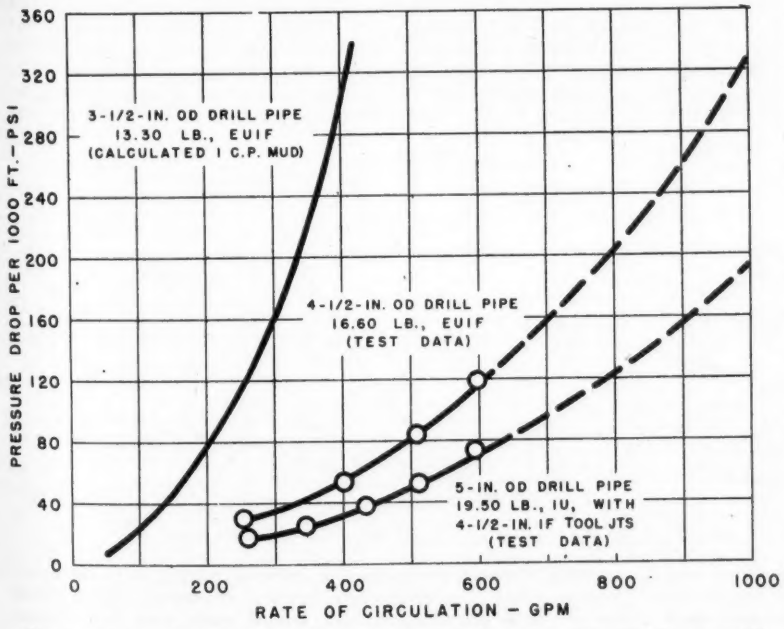


Fig. 1—Pressure drop through drill pipe (natural shale mud, weight 10.3 lb. per gal.)

Enlarge Bit Nozzles

Another means of circulating a maximum volume of mud with available equipment is to enlarge bit nozzles. The pressure drop through bit nozzles was investigated, and it was found that two 1⅛-in. nozzles, as shown by theoretical data in Fig. 2, required a pressure of from 50 to 200 psi. when used with circulating rates on the order of 400 to 700 g.p.m. The calculated pressure drops have been found in close agreement with the data obtained from field tests.

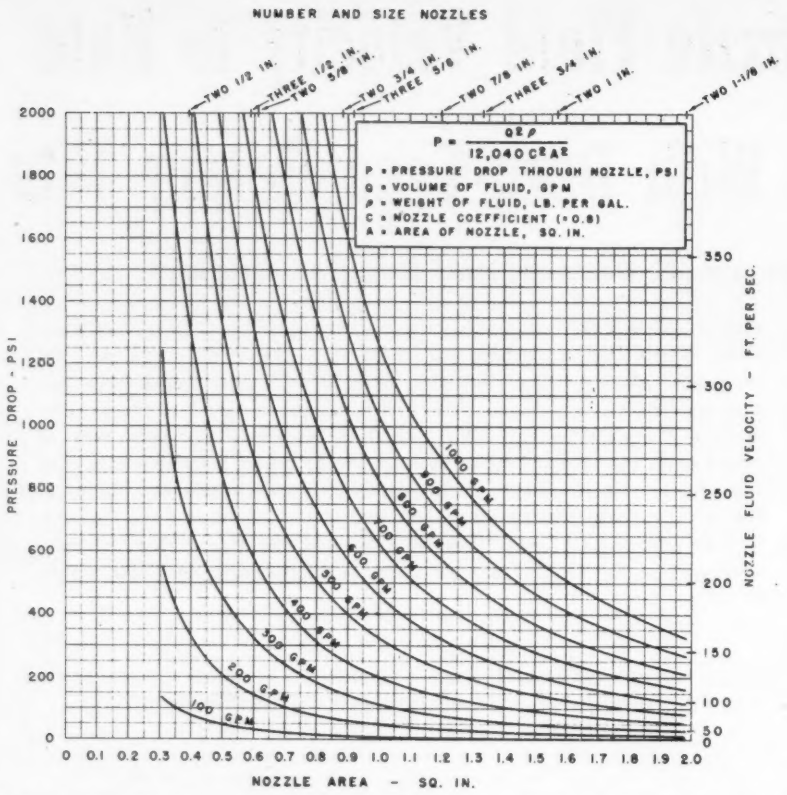


Fig. 2—Calculated pressure drop through drilling-bit nozzles (mud weight, 10.0 lb. per gal.)

Since a pressure drop through the bit of 50 to 200 psi. was considered of minor order in the total pressure required in the circulating system, two 1⅛-in. nozzles for each two-way drag bit were adopted as standard in Humble's drag-bit drilling operations.

The pressure drop through the standpipe, hose, swivel, kelly, and drill collars, as shown by test data, was not considered great enough to alter the size of any of these pieces of equipment. The magnitude of the return losses also is small.

In addition to the means adopted for circulating the maximum volume of drilling fluid with available equipment, Humble conducted drilling tests in seven wells during the latter part of 1944 to determine further the relationship of circulating rate to drilling rate. The results obtained in five of these wells are shown in Table 1, and the results obtained in the remaining two are illustrated in Fig. 3. The tests shown in Table 1 were conducted by alternating single and compound pump operation between joints, whereas the test results shown in Fig. 3 were obtained by throttled operation of a single 20-in. duplex pump while drilling from 43 to 175 ft. of hole at each rate of circulation in uniform formation. The data show that the drilling rate varied directly with the circulating rate. However, during the tests, little attention was given to nozzle fluid velocity or to bit weight, which were later to be recognized as very important factors.

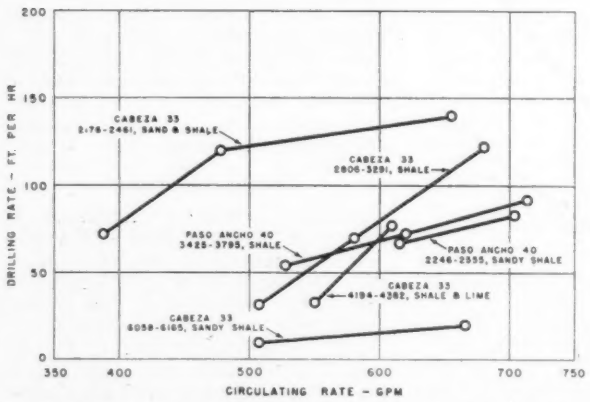
Factors affecting drilling rate.—The promising results indicated by the preliminary work on hydraulics led to the initiation, early in 1946, of a petroleum-engineering research project to conduct an intensive study of drag bit drilling technique directed toward the evaluation of all factors which affect rate of penetration.

Circulating Rate

It was recognized that rate of circulation and bit weight were very important factors in drag bit drilling; that is, at higher rates of circulation a greater bit weight than had heretofore been considered good practice could be used without endangering the hole.

In Fig. 4, the results of one of the first tests conducted to determine the interrelation of bit weight, circulating rate, and nozzle fluid velocity is shown. The section to be tested was located by means of an electric survey of an offset well as a uniform section of shale. The data show that a greater bit weight can be effectively maintained on the bit at a greater circulating rate. At a circulating rate of 290 g.p.m., the maximum possible drilling rate was 75 ft. per hour, whereas at 631 g.p.m., the maximum possible drilling rate was 400 ft. per hour.

The data also illustrate the importance of maintaining a bit weight just short of the balling-up point, if full advantage is to be obtained of an increase in the volume of mud circulated. At 20,000 lb. bit weight, penetration was great enough that complete balling up occurred at all cir-



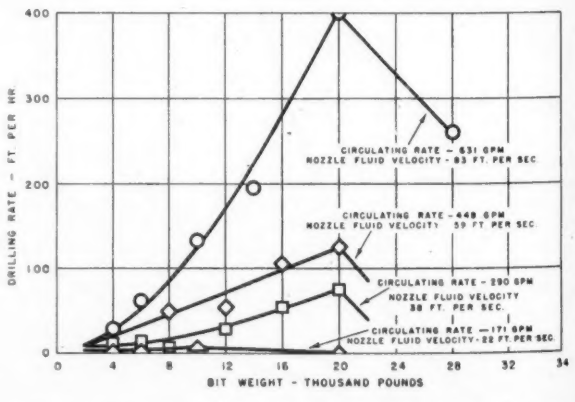

DRILLING RATE - FT. PER HR.
BIT WEIGHT - THOUSAND POUNDS
CIRCULATING RATE - 631 GPM
NOZZLE FLUID VELOCITY - 83 FT. PER SEC.
CIRCULATING RATE - 448 GPM
NOZZLE FLUID VELOCITY - 59 FT. PER SEC.
CIRCULATING RATE - 290 GPM
NOZZLE FLUID VELOCITY 38 FT. PER SEC.
CIRCULATING RATE - 171 GPM
NOZZLE FLUID VELOCITY - 22 FT. PER SEC.

Fig. 3—(Left) Drilling rate of two-way drag-type bits vs. rate of circulation. Constant nozzle diameter (speed of rotation 85 to 110 r.p.m.; bit weight 6,000 to 10,000 lb.) South Texas area. Fig. 4—(Right) Combined effect of circulating rate, nozzle fluid velocity, and bit weight vs. rate of drilling. Two-way drag-type bits, constant speed of rotation. (Mud properties constant, uniform shale: King Ranch-Cabeza 68 well, 3,110 to 3,212 ft.) South Texas area

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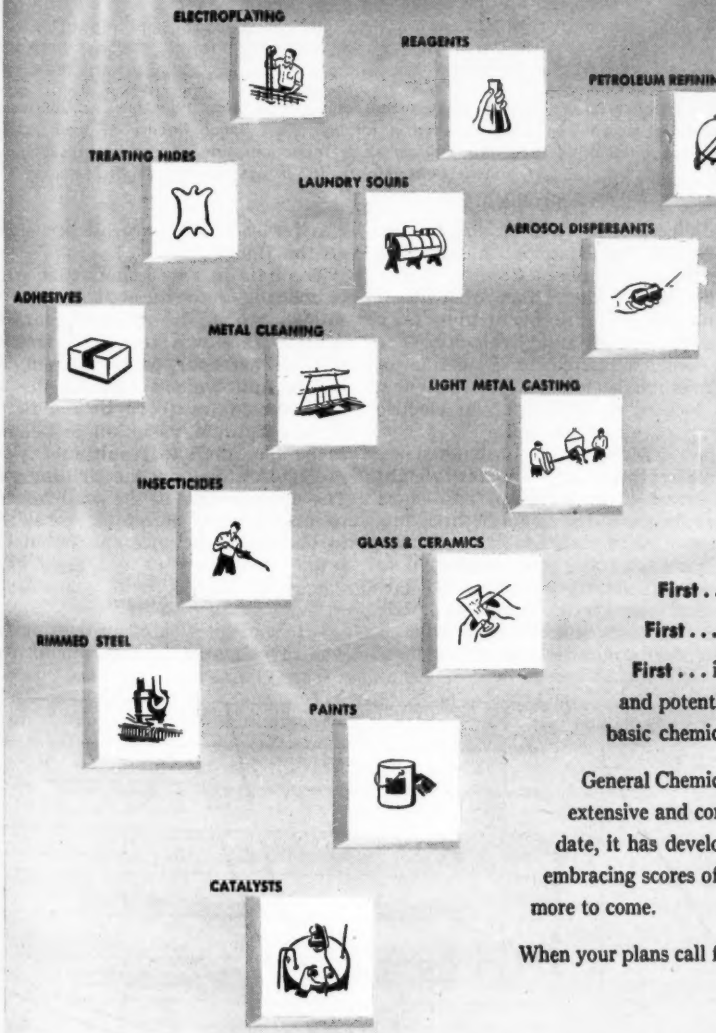

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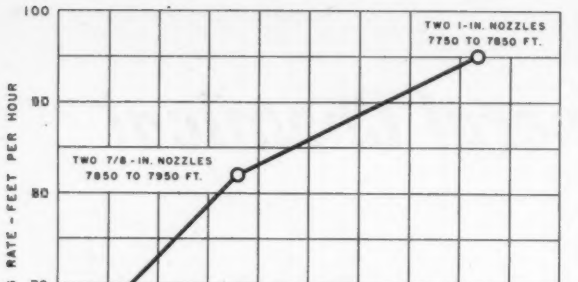

TWO 1-IN. NOZZLES
7750 TO 7850 FT.
TWO 7/8-IN. NOZZLES
7850 TO 7950 FT.
TWO 3/4-IN. NOZZLES
7650 TO 7750 FT.
DRILLING RATE - FEET PER HOUR
RATE OF CIRCULATION - GPM

Fig. 5—Drilling rate of two-way drag-type bits vs. rate of circulation. Near constant nozzle fluid velocity, and maximum effective bit weight (nozzle fluid velocity, 110 to 138 ft. per second; bit weight 8,000 to 10,000 lb.; uniform shale formation; speed of rotation, 140 r.p.m.). Texas Gulf Coast area

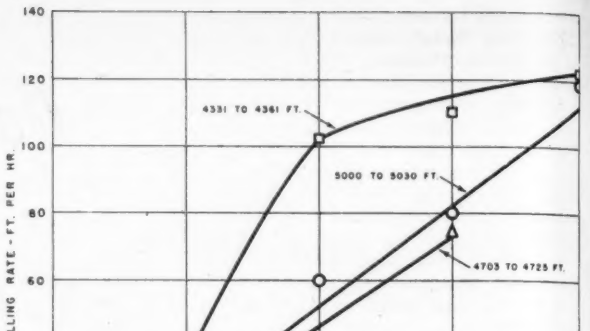


Fig. 6—Drilling rate of two-way drag type bits vs. bit weight. Constant speed of rotation (King Ranch Cabeza 67 well, 4,331 to 5,030 ft.; uniform shale formation; rate of circulation 820 g.p.m.; nozzle fluid velocity, 107 ft. per second). South Texas area

culating rates and nozzle fluid velocities employed.

Because the data shown in Fig. 4 was obtained with the use of only one bit, the nozzle fluid velocity necessarily varied directly with the circulating rate. Hence, the exact effect of either circulating rate or nozzle fluid velocity could not be determined, inasmuch as both factors were variable during the test. However, the over-all results show that a 117 per cent increase in both circulating rate and nozzle fluid velocity resulted in a 433 per cent increase in drilling rate at a bit weight just short of the balling-up point. Furthermore, extremely low rates of circulation resulted in no drilling progress.

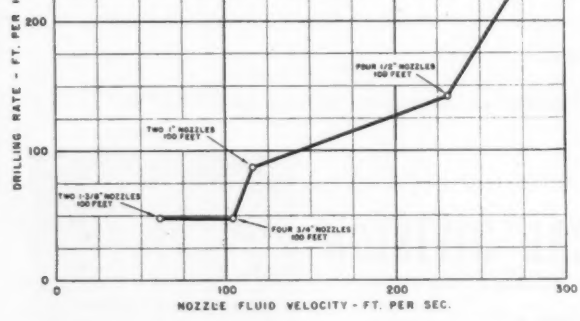
To isolate the effect of rate of circulation, a test was conducted in Galveston Bay State A-39, Red Fish Reef field, Chambers County, Texas, to determine the effect of rate of circulation on rate of drilling at a constant nozzle fluid velocity. The test was conducted in a section of uniform shale near 8,000 ft. which was located by means of an electric survey of an offset well.

The drillers were instructed to maintain the maximum bit weight just short of balling up, and short intervals were drilled with three bits equipped with various sized nozzles. The results of the test are shown in Fig. 5, where the variation of circulating rate with constant nozzle fluid velocity and drilling rate is plotted. The number and size of nozzles for each two-way bit are shown on the figure.

The data in Fig. 5 show that as the circulating rate increased from 381 to 568 g.p.m., or 49 per cent, the drilling rate was increased from 65 to 97 ft. per hour, or 49 per cent. The nozzle fluid velocity during the test only varied from 116 to 138 ft. per second. Such a variation is believed to be too small to result in any appreciable effect on the drilling rate. The drilling rate in the well referred to above was, therefore, considered to vary directly with the circulating rate.

Bit Weight

Effect of bit weight on drilling rate was investigated further during tests


TWO 3/8" NOZZLES 100 FEET
FOUR 1/2" NOZZLES 100 FEET
TWO 1" NOZZLES 100 FEET
TWO 1-3/8" NOZZLES 100 FEET
FOUR 3/8" NOZZLES 100 FEET
DRILLING RATE - FT. PER HR.
NOZZLE FLUID VELOCITY - FT. PER SEC.

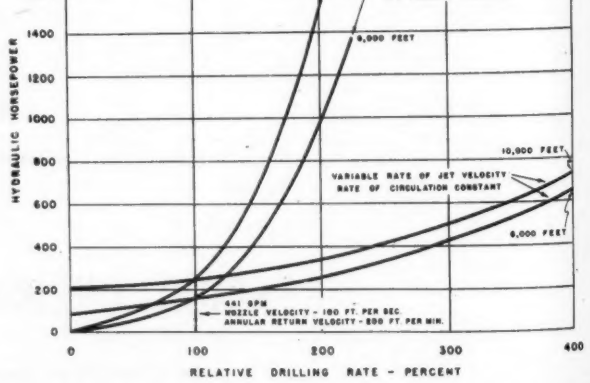

10,000 FEET
VARIABLE RATE OF CIRCULATION JET VELOCITY CONSTANT
8,000 FEET
10,000 FEET
VARIABLE RATE OF JET VELOCITY RATE OF CIRCULATION CONSTANT
8,000 FEET
441 GPM
NOZZLE VELOCITY - 100 FT. PER SEC.
ANNULAR RETURN VELOCITY - 500 FT. PER MIN.
HYDRAULIC HORSEPOWER
RELATIVE DRILLING RATE - PERCENT

Fig. 7—(Left) Drilling rate of two-way drag type bits vs. nozzle fluid velocity. Maximum effective bit weight (rate of circulation 570 g.p.m.; speed of rotation 140 r.p.m.; bit weight 2,000 to 10,000 lb.). Data from Frank Schmidt 3 well, 5,366 to 5,866 ft. Formation, uniform shale. Texas Gulf Coast area. Fig. 8—(Right) Hydraulic horsepower vs. drilling rate. Constant speed of rotation and maximum effective bit weight (drill pipe, 4½-in. 16.60 lb. E.U.I.F.; mud weight, 10.0 to 10.3 lb. per gal.)

conducted from 4,331 to 5,030 ft. in 67 King Ranch Cabeza well, Seeligson field, Kleberg County, Texas, where 6-ft. intervals of uniform shale in each test were drilled at various bit weights while the circulating rate and nozzle fluid velocity were maintained constant at 820 g.p.m. and 107 ft. per second, respectively. Indications during the tests were that the bit was clean at all bit weights; therefore, the factor of a balled-up bit did not enter into the tests.

The results of the tests illustrated graphically in Fig. 6 show that the drilling rate varies directly with bit weight. A maximum bit weight of 32,000 lb. was used during the tests because of a limited number of drill collars in use. However, had enough bit weight been applied to the bit, balling up would have occurred, and rate of drilling would have slowed or stopped. This effect is illustrated in Fig. 4 where the bit weight at each rate of circulation was increased until the bit was balled up. In addition to the balling up effect shown in Fig. 4, the effect of bit weight on rate of drilling is also shown.

Nozzle Fluid Velocity

A series of tests was conducted in the 3 Frank Schmidt well, Danbury field, Brazoria County, Texas. Data from the well on drilling rate versus fluid velocity are plotted in Fig. 7. The results indicate that the rate of drilling that can be obtained with drag-type bits in the type of shale encountered in the 3 Schmidt is in direct proportion to the nozzle fluid velocity when the rate of circulation is constant and a maximum effective bit weight is maintained.

To evaluate the relation of nozzle fluid velocity to drilling rate on a per-well basis, the 8⅝-in. hole in three wells in Borregas field, Kleberg County, Southwest Texas, was drilled with two-way bits equipped with 1⅛-in. i.d. bit nozzles for one well and ⅝-in. i.d. nozzles for two wells, while the rate of circulation was maintained approximately constant between wells. Maximum effective bit weights not exceeding 40,000 lb. were employed for all three wells and rotary speeds ranged from 100 to 175 r.p.m. for each of the three wells.

The drilling data accumulated during these tests are summarized in Table 2. A comparison of the Borregas wells shows that the drilling rate varied with the nozzle fluid velocity used in the wells. Two wells were also drilled in Sugar Valley field, Matagorda County, Texas, where two-way bits equipped with two 1⅛-in. i.d. nozzles were used in one well and two-way bits equipped with two ½-in. nozzles were used in other well (data in Table 3). In Sugar Valley wells it is seen that a 34 per cent decrease in circulating rate and a 228 per cent increase in nozzle fluid velocity resulted in a 101 per cent increase in drilling rate in the 2 Truitt and Gravier when compared with the 2 A. B. Taylor, while the hydraulic horsepower developed in the two wells was approximately equal.

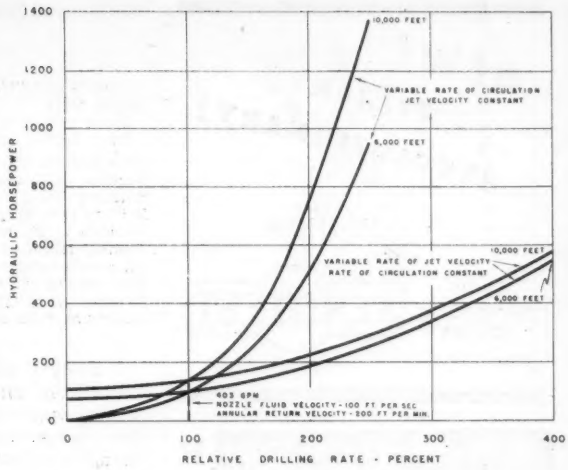


Fig. 9—Hydraulic horsepower vs. drilling rate. Constant speed of rotation and maximum effective bit weight (drill pipe 5-in. o.d. 19.50 lb. equipped with 4½-in. I.F. tool joints; mud weight 10.0 to 10.3 lb. per gal.)

Hydraulic Horsepower

The data obtained by Humble concerning drilling with commercial drag-type bits indicate that two hydraulic relationships exist; namely, (1) the rate of drilling is directly proportional to the nozzle fluid velocity when the rate of circulation is constant, and (2) the rate of drilling is directly proportional to the circulating rate when the nozzle fluid velocity is constant.

In Fig. 8, the variation of relative drilling rate with hydraulic horsepower at (1) variable circulating rate and constant nozzle fluid velocity and (2) variable nozzle fluid velocity and constant circulating rate are shown for 8⅝-in. two-way bits, 4½-in. 16.60-lb. E.U.I.F. drill pipe and approximately 10.0-lb.-per-gal. mud at depths of 6,000 and 10,000 ft.

Fig. 9 shows the same information with the exception that 5-in. o.d. drill pipe is used in the calculations in place of the 4½-in. E.U.I.F. drill pipe. A relative drilling rate of 100 per cent was assumed to be the drilling rate that could be obtained at a nozzle fluid velocity of 100 ft. per second and an annular return velocity of 200 ft. per minute.

Figs. 8 and 9 show that any increase in drilling rate above the 100 per cent points can best be obtained by an increase in nozzle fluid velocity, rather than an increase in circulating rate for the depths illustrated. For greater depths, the horsepower advantage of increased nozzle fluid velocity over increased rate of circulation as a means of increasing drilling rate becomes rapidly larger. At shallower depths, the horsepower advantages to be gained by the nozzle fluid velocity method gradually decrease, but are never entirely eliminated.

Thus, the fastest rate of drag-bit drilling with any particular rig can be obtained when most of the horsepower available for mud circulation above that amount required to supply a safe annular return velocity is utilized to increase the bit nozzle fluid velocity.

High Nozzle Fluid Velocity

An attempt to drill a complete 8⅝-in. hole in a Sugar Valley field well with a nozzle fluid velocity near 300 ft. per second, while using two-way, standard curved-bladed bits equipped with alloy-steel nozzles directed to the blades was not successful, because of excessive fluid erosion of the nozzles. A switch to tungsten-carbide nozzles resulted in erosion of the bit blades.

Tungsten-carbide nozzles directed ahead of blades were therefore adopted in order to eliminate all erosion; straight blades were substituted for curved blades in order that the nozzles could be directed as far ahead of the blades as possible in the limited space available.

TABLE 2—EFFECT OF NOZZLE FLUID VELOCITY AND HYDRAULIC HORSEPOWER ON RATE OF DRILLING
Borregas Field — South Texas Area

Borregas lease—	Well 19	Well 42	Well 16
Depth, feet:			
From	2,049	2,064	2,050
To	6,895	6,875	6,872
Hole drilled, ft.	4,362	4,429	4,467
Rotating hours	151.78	79.43	39.20
Drilling rate, ft. per hr.	28.7	59.1	114.0
Average circulating rate, g.p.m.	550	487	700
Number of nozzles (two) and diameter, in. i.d.	1⅛	⅝	⅝
Bit nozzle fluid velocity, ft. per sec.	90	255	375
Total hydraulic horsepower	200	313	800
Average bit weight, lb.	15,000	20,000	30,000
Maximum hole deviation, deg.	2½	2½	3¼

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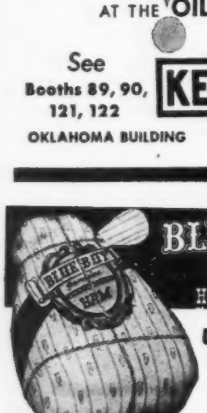

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TABLE 3—EFFECT OF NOZZLE FLUID VELOCITY AND HYDRAULIC HORSEPOWER ON RATE OF DRILLING
Sugar Valley Field — Gulf Coast, Texas Area

Lease and well number—	2 A. B. Taylor	2 Truitt and Gravier
Depth, feet:		
From	3,050	3,050
To	8,030	8,168
Hole drilled, ft.	4,980	5,118
Number of bits used	7	4
Rotating hours	102.30	52.30
Drilling rate, ft. per hr.	48.68	97.86
Average circulating rate, g.p.m.	736	479
Number and diameter of nozzles (two), in.	1⅛	½
Bit nozzle fluid velocity, ft. per sec.	119	391
Total hydraulic horsepower	403	419
Average bit weight, lb.	9,000	25,000
Maximum hole deviation, deg.	3¼	4½

A study of the effect of blade angle and nozzle direction on the rate of drilling was conducted in the 1 Truitt and Gravier well, Sugar Valley field, Matagorda County, Texas, where 75-ft. intervals of uniform shale, as located by an electric log of an offset well, were drilled with bits equipped with nozzles directed to various points in front of standard curved blades and straight blades. The nozzles were directed to the same location on the bottom of the hole, approximately 1 in. from the wall, regardless of how far in front of the blade they were directed.

Results of the 1 Truitt and Gravier test indicated that, from the standpoint of drilling rate, the straight-bladed bit with nozzles directed ahead of the blades is as good, or better than the standard curved-bladed bit equipped with nozzles directed to the blades.

It had not been determined, however, whether straight-bladed bits equipped with nozzles directed ahead of the blades would perform satisfactorily at low nozzle fluid velocities near 100 ft. per second. To determine this, a portion of the 8⅝-in. hole was drilled with bits equipped with nozzles directed 1½ in. ahead of straight blades in the 33 King Ranch Borregas well, Borregas field, Kleberg County, Texas, at an average nozzle fluid velocity of 90 ft. per second.

When the drilling with the straight-bladed bits was compared with the drilling of the standard curved bladed bits in the 19 King Ranch Borregas well 6,500 ft. away, where equal circulating rates, nozzle sizes, and drilling techniques were used, the straight-bladed bits with nozzles directed ahead of the blades performed better than the standard bits.

As an aid in finding the most advantageous direction for drag-bit nozzles, chip formation studies were conducted in clays of various hardness and in paraffin. It was noted that the chips were similar in nature and tended to curve upward and away from the blade.

The chip studies also showed that nozzle fluid directed ahead of the blades should break or disintegrate the chip better than nozzle fluid directed toward the blade. Bits equipped with nozzles directed 1½ in. ahead of straight blades were used on all of the high nozzle fluid-velocity tests illustrated by Tables 2 and 3.

The drilling tests summarized in this paper indicate that washing out the hole ahead of the bit was of minor importance and that the bit blades were responsible for the drilling of the formation, except in very soft formation near the surface. In the soft formations near the surface where no weight could be detected on the weight indicator during the drilling, the formation was found to wash out ahead of the bit as much as 3 ft. in 30 seconds. However, in formations that required weight to drill, no washing out ahead of the bit could be detected. It is, therefore, believed that the major function of the nozzle

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fluid is the disintegration of the chips that are formed by the bit blades.

Annular Return Velocity

Annular return velocity needed for drilling depends on several factors including the rate of drilling, mud viscosity, and sloughing tendency of the hole.

Formulas for the slip velocity of particles were presented by Pigott.[2] The turbulent or maximum slip velocity in water of a round flat particle 0.5 in. in diameter, according to Pigott, is 0.90 ft. per second, or 54 ft. per minute. Inasmuch as drill cuttings are predominantly flat and are usually less than 0.5 in. in diameter, and drilling mud with a greater lifting capacity than water is normally in use, it is believed that an annular return velocity at some value greater than 54 ft. per minute should be satisfactory for most drag bit drilling.

In Humble's drag-bit drilling operations, an annular return velocity based on the theoretical value of 200 ft. per minute has been used with success. It is believed that the upper limit of usable return velocity is the point at which turbulent flow occurs in the annular space. Any increase in circulating rate above the turbulent flow point would increase the problem of lost returns because of the rapid increase in pressure on the formation.

Properties of Drilling Mud

It is frequently stated that the rate of drilling with drag-type bits is retarded at extremely high mud weights. When drilling in abnormally high pressure formation areas, precautions which slow down the drilling rate are usually employed. Also, as the pressure drop in the circulating system is proportional to the mud density, the change from a normal to a high weight mud results in a reduction in the mud volume circulated, unless provisions are made to increase the circulating capacity of the mud pumps. This reduction in mud-circulating rate, and not necessarily the change in the mud weight, can contribute considerably to the reduced drilling rate.

Hole Deviation

To gain full advantage of either increasing circulating rate or bit nozzle fluid velocity, it has been shown that the bit weight must also be increased. To overcome the possibility of deviated holes, Humble used 270 ft. of 6¾-in. o.d. by 2⅛-in. i.d. drill collars having a total weight of 27,000 lb. during the tests shown in Tables 2 and 3.

The tests show a slight trend toward greater deviation with increased bit weights, but the deviation of the wells was within acceptable limits and does not vary appreciably from the average deviation for other wells that have been drilled using a smaller amount of bit weight.

Rotary Speed and Other Factors

The drilling tests that are summarized in this paper were conducted at rotary speeds that are normally accepted as good practice by drillers. The rotary speeds varied between 100 and 175 r.p.m., with the greater speeds being used with the faster rates of drilling. It is known that there is a definite relationship between speed of rotation and rate of drilling with drag-type bits; furthermore, it is realized that vibration of the drill stem and heating of the bit when higher speeds of rotation are used limit the maximum rotary speed that may be employed. Tests are now in progress to establish a more exact relationship of rotary speed with rate of drilling and to determine practical upper limits of speed for drag-bit drilling.

Another factor that will influence the rate of drilling and bit life as well is the number of blades on a single bit, since a greater number of blades offers a greater wearing surface. The effect of the number of bit blades on the rate of drilling at the higher nozzle fluid velocities is now being investigated by Humble. The number of bit blades that may be used along with Humble's adaptation of increased nozzle fluid velocities is limited, however, due to the

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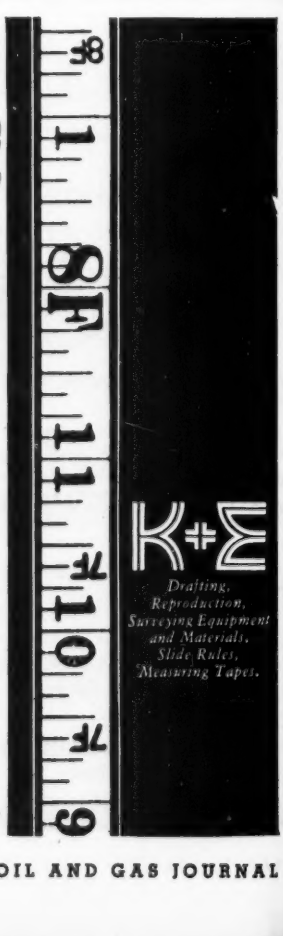

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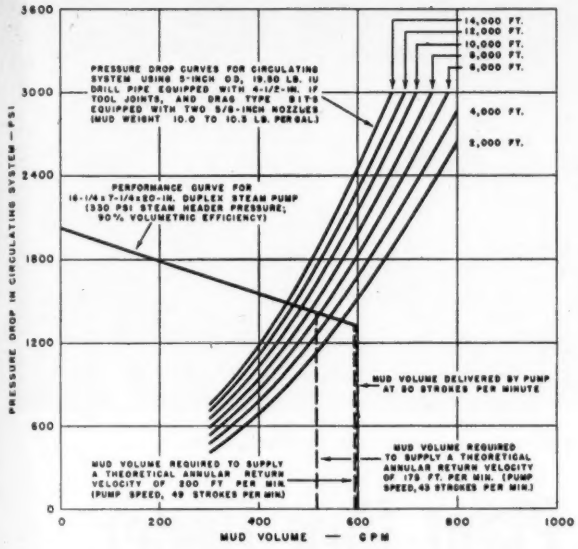
PRESSURE DROP CURVES FOR CIRCULATING SYSTEM USING 5-INCH OD, 19.50 LB. IU DRILL PIPE EQUIPPED WITH 4-1/2-IN. IF TOOL JOINTS, AND DRAG TYPE BITS EQUIPPED WITH TWO 5/8-INCH NOZZLES (MUD WEIGHT 10.0 TO 10.3 LB. PER GAL.)
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14,000 FT.
12,000 FT.
10,000 FT.
8,000 FT.
6,000 FT.
4,000 FT.
2,000 FT.
MUD VOLUME DELIVERED BY PUMP AT 50 STROKES PER MINUTE
MUD VOLUME REQUIRED TO SUPPLY A THEORETICAL ANNULAR RETURN VELOCITY OF 200 FT. PER MIN. (PUMP SPEED, 49 STROKES PER MIN.)
MUD VOLUME REQUIRED TO SUPPLY A THEORETICAL ANNULAR RETURN VELOCITY OF 175 FT. PER MIN. (PUMP SPEED, 43 STROKES PER MIN.)
PRESSURE DROP IN CIRCULATING SYSTEM — PSI
MUD VOLUME — GPM
3600
3000
2400
1800
1200
600
0
200
400
600
800
1000

Fig. 10—Chart for determining size of nozzles (in 9⅞-in. two-way drag-type bits)

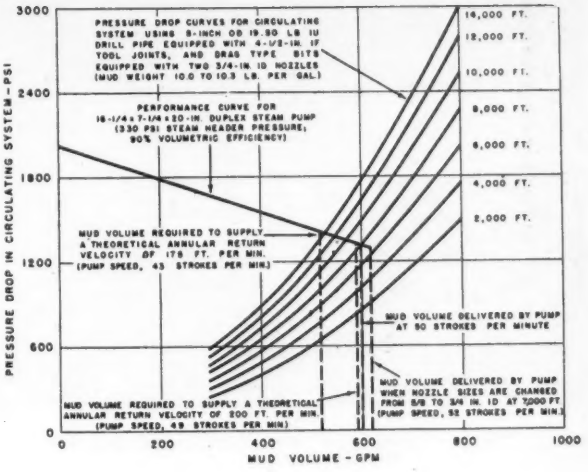
PRESSURE DROP CURVES FOR CIRCULATING SYSTEM USING 5-INCH OD 19.50 LB IU DRILL PIPE EQUIPPED WITH 4-1/2-IN. IF TOOL JOINTS, AND DRAG TYPE BITS EQUIPPED WITH TWO 3/4-IN. ID NOZZLES (MUD WEIGHT 10.0 TO 10.3 LB. PER GAL.)
PERFORMANCE CURVE FOR 16-1/4 x 7-1/4 x 20-IN. DUPLEX STEAM PUMP (330 PSI STEAM HEADER PRESSURE; 90% VOLUMETRIC EFFICIENCY)
16,000 FT.
12,000 FT.
10,000 FT.
8,000 FT.
6,000 FT.
4,000 FT.
2,000 FT.
MUD VOLUME REQUIRED TO SUPPLY A THEORETICAL ANNULAR RETURN VELOCITY OF 175 FT. PER MIN. (PUMP SPEED, 43 STROKES PER MIN.)
MUD VOLUME DELIVERED BY PUMP AT 50 STROKES PER MINUTE
MUD VOLUME DELIVERED BY PUMP WHEN NOZZLE SIZES ARE CHANGED FROM 5/8 TO 3/4 IN. ID AT 7,000 FT. (PUMP SPEED, 52 STROKES PER MIN.)
MUD VOLUME REQUIRED TO SUPPLY A THEORETICAL ANNULAR RETURN VELOCITY OF 200 FT. PER MIN. (PUMP SPEED, 49 STROKES PER MIN.)
PRESSURE DROP IN CIRCULATING SYSTEM — PSI
MUD VOLUME — GPM
3000
2400
1800
1200
600
0
200
400
600
800
1000

Fig. 11—Chart for determining size of nozzles (in 9⅞-in. two-way drag-type bits)

nozzle being directed 1½ in. ahead of the blade.

Application

To apply the results of drag-bit drilling research to actual drilling practices, Humble has adopted the following program on a number of company drilling rigs engaged in drag-bit drilling:

1. As near as practical, most of the available horsepower for mud circulation above the amount required to supply a safe annular return is applied to increasing the bit nozzle fluid velocity.

2. Straight-bladed bits equipped with a single tungsten-carbide nozzle directed 1½ in. ahead of each blade are used for all two-bladed bit requirements in 12¼-in., 9⅞-in., and 8⅝-in. hole. The nozzles are round and vary in i.d. by the eighth-inch from ½ to 1⅛ in.

3. Unless justified by unusual hole conditions, the annular return velocity is maintained as close as practical to theoretical value of 200 ft. per minute with a minimum of 175 ft. per minute.

4. Pump liners are used that will provide the required annular return velocity at 50 s.p.m., except where the minimum sized nozzles are used and the pump or pumps will operate in excess of 55 s.p.m. In such instances, larger liners are installed. A minimum sized liner of 6½ in. i.d. is recommended for pumps in the 18 and 20-in. stroke sizes.

5. The maximum bit weight possible so as not to cause a deviated hole or ball up the bit is used.

In the application of such a program, primary attention is given to the hole size requiring the major portion of the drilling time. For instance, in most field drilling, surface pipe is set at depths varying from 1,000 to 4,000 ft., after which the hole for the production string is drilled to the total depth of the well.

Inasmuch as the major portion of the drilling time will be consumed in drilling the production string hole, the most suitable sized pump liners are installed for this drilling; i.e., pump liners which will provide a theoretical annular return velocity of 200 ft. per minute at a pump speed of 50 s.p.m.

In the larger surface hole, the pumps are operated in parallel, and bit nozzles are installed which will allow the pumps to operate at 50 s.p.m. each in order to approach the desirable annular return valocity.

Example—Nozzle Sizes

Prior to the application of the recommended drilling practices, close estimates may be made of the nozzle sizes that will be required in the drilling of a well with any particular rig.

An example is given as follows: A well is to be drilled to 10,000 ft. with a rig equipped with an 18-in. diameter steam end, 20-in. stroke mud pump, 5-in. o.d. drill pipe (4½ I.F. tool joints), and 350 psi. boilers. Surface hole will be drilled to 3,000 ft., below which 9⅞-in. production string hole will be drilled to a total depth of 10,000 ft. The size of the rig is such that only one pump operation can be maintained on the production string hole.

Solution.—The major portion of the drilling will be 9⅞-in. hole; therefore, pump liner sizes will be installed so as to provide at 50 s.p.m. a theoretical annular return velocity of 200 ft. per minute in the 9⅞-in. hole.

Volume calculations show that 592 g.p.m. will supply the desired annular return velocity. The volume per stroke required for the pump would be 592 divided by 50, or 11.84 gal. At 90 per cent volumetric efficiency and 2¾-in. rods, the nearest sized pump liner available would be 7¼-in. i.d., which would deliver 11.94 gal. per stroke.

Determination of the size of nozzles to use in the 9⅞-in. hole is illustrated in Figs. 10 and 11. In Fig. 10, the performance curve of the 18 by 7¼ by 20-in. steam pump is plotted in conjunction with the pressure drop in the circulating system of the rig when two ⅝-in. nozzles are in use, and in Fig. 11 the performance curve of the same pump is plotted in conjunction with the pressure drop in the circulating system when two ¾-in. nozzles are in use.

The performance curve of the pump was determined by drawing a straight line between the stall pressure of the pump based on a steam header pressure of 330 psi. (20 psi. lower than boiler pressure to allow for steam-line pressure drop) and the operating pressure at 50 s.p.m. based on 65 per cent stall pressure and 90 per cent volumetric efficiency. In Fig. 10, it can be seen that the ⅝-in. nozzles can be used to an approximate depth of 7,000 ft., at which depth the annular return velocity will have decreased to the minimum recommended rate of 175 ft. per minute. Below 7,000 ft., two ¾-in. nozzles should be used since this is the next larger sized nozzle that is used in Humble's drilling program. In Fig. 11, it can be seen that the ¾-in. nozzles could be used satisfactorily to the total depth of the 10,000-ft. well and even at depths in excess of 14,000 ft.

Should the size of the rig be such that two 18 by 7¼ by 20-in. pumps are operated in series, the operating pressure of the two pumps would be twice the amount shown in Figs. 10 and 11. Thus, smaller-sized nozzles could be used through the same depth of hole intervals when compared with a single pump operation.

Conclusions

Within the limits of this investigation where two-bladed drag-type bits were rotated at speeds of from 100 to 175 r.p.m. in drilling 8⅝ to 12¼-in. holes in the Texas-Louisiana Gulf Coast areas at maximum efficient bit weights up to 40,000 lb.

1. Drilling rate is directly proportional to nozzle fluid velocity.

2. Drilling rate is directly proportional to circulating rate.

3. The maximum rate of drilling with two-way drag bits is obtained when the maximum weight just short of balling up is applied to the bit;

(Continued on page 108)

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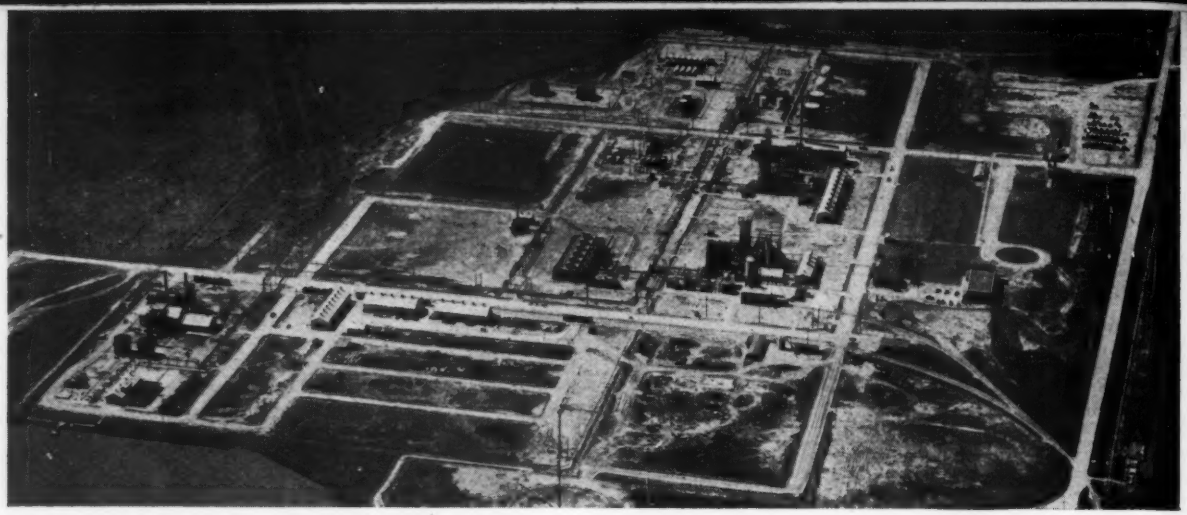


Aerial view of the recently completed Jefferson Chemical Co., Inc., plant near Port Neches, Tex.

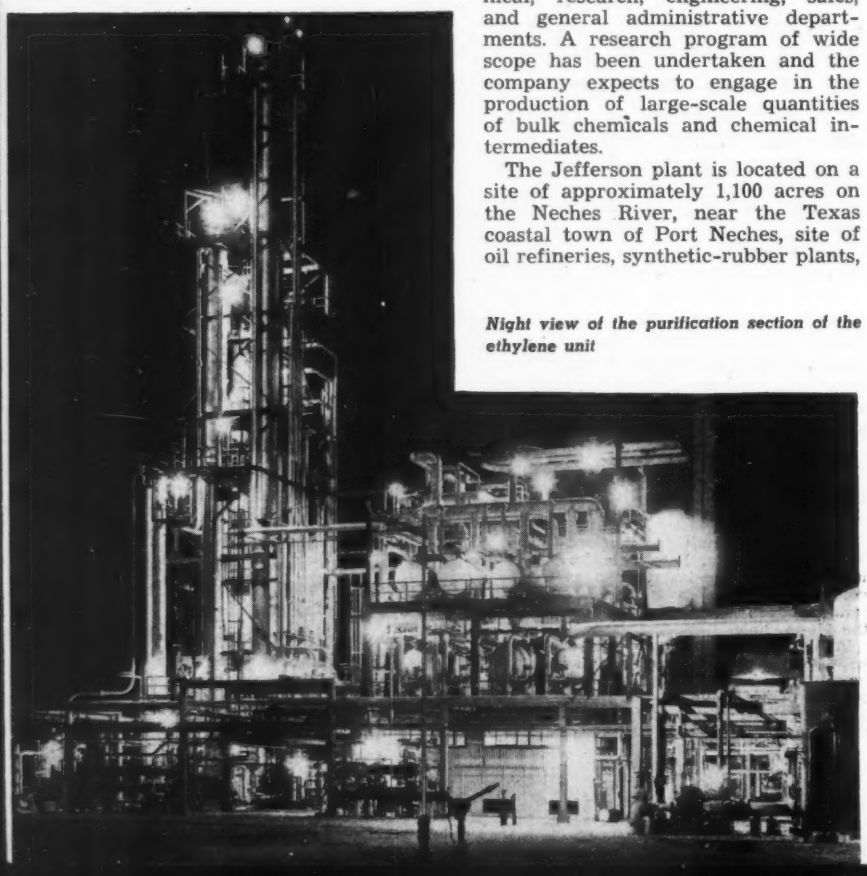
Jefferson Chemical Plant Now Under Full Operation at Port Neches

by Arch L. Foster

MANUFACTURING ethylene glycol, ethylene oxide, and ethylene dichloride, along with other hydrocarbon-derived chemicals, the Jefferson Chemical Co.'s Port Neches, Tex., chemical plant is now in full production. This large plant represents a considerable addition to the Gulf Coast chemical production capacity.

Formed in 1944 as a joint enterprise by The Texas Co. and American Cyanamid Co., Jefferson Chemical operates as an independent integrated organization, including its own technical, research, engineering, sales, and general administrative departments. A research program of wide scope has been undertaken and the company expects to engage in the production of large-scale quantities of bulk chemicals and chemical intermediates.

The Jefferson plant is located on a site of approximately 1,100 acres on the Neches River, near the Texas coastal town of Port Neches, site of oil refineries, synthetic-rubber plants, and other industrial production facilities. Nearby is the 135,000-bbl.-per-day Port Arthur refinery of The Texas Co., producing large quantities of refinery gases as raw materials for the chemical syntheses employed in the plant. In addition to the existing site and plant, American Cyanamid has a tract of some 900 acres adjoining, the utilization of which has not been disclosed. Raw-material gases are transferred via pipe line a distance of 5 miles from refinery to plant. Only about 100 acres of the Jefferson tract is occupied now by the existing plant.



Night view of the purification section of the ethylene unit

The over-all design and layout of the plant has been developed with a long-range systematic scheme in mind. The plant's central block is allocated to process units and to spaces for cooling towers, intermediate surge tanks, etc. Located between two of the main roads of the plant, this area may be extended for approximately 1 mile, if and when that is desirable. Within this process block, one side is devoted to installation of water-treating facilities, including the boiler unit and power plant, the plant warehouses, fabricating and maintenance shops, and storage space for various materials.

One-Half Mile River Frontage

The entire plant tract fronts more than half a mile on the Neches River, and will be connected across a strip of land by various pipe lines for conveying finished products to dockside for water shipment. A large

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area is set aside also for the various administrative buildings, including the plant laboratory, office building, a cafeteria, and a locker building.

The Neches River alongside is deepened to permit sea-going vessels to load from the plant dock.

Three Process Units

At present the plant includes three main process units. In the ethylene unit the refinery gases from The Texas Co. refinery tail gases are purified by treatment with ethanolamine to remove the carbon dioxide and hydrogen sulfide impurities found in the gases. This purified gas is combined then with the cracked gases from the cracking heaters, the whole is compressed and fractionated, much of it at low temperatures requiring refrigeration to recover the light components. Liquid propane and ethane are employed as refrigerants, being obtainable directly from the gases and liquefied during the compression stage.

Eight heaters are installed, arranged in two banks of four heaters each. Forty burners are placed in each furnace floor. With a common flue for each bank, a waste heat boiler is installed in each flue, and generate steam at 175 psig. which is supplied to the plant's high-pressure steam system. Two sets of driers are installed to dry the feed stock entering the low-temperature fractionators; gas is heated in a special heating coil in each flue to regenerate these driers. As to the necessity for periodic decoking of the heating units, this is done by burning the coke from the inside of the heater tubes, where it has been deposited, with a mixture of steam and air so proportioned that the proper temperature and rate of burning is maintained in the tubes.

The gas-compressor section includes 10 angle-type gas-engine-driven compressors of which 6 are used to compress propane in the refrigeration system, and the other four compress the feed and heater effluent gases.

Night view of the compressors in the ethylene unit showing suction and discharge piping. The aisle at the left is a typical illustration of provisions made in the layout for ease of access for maintenance and fire protection

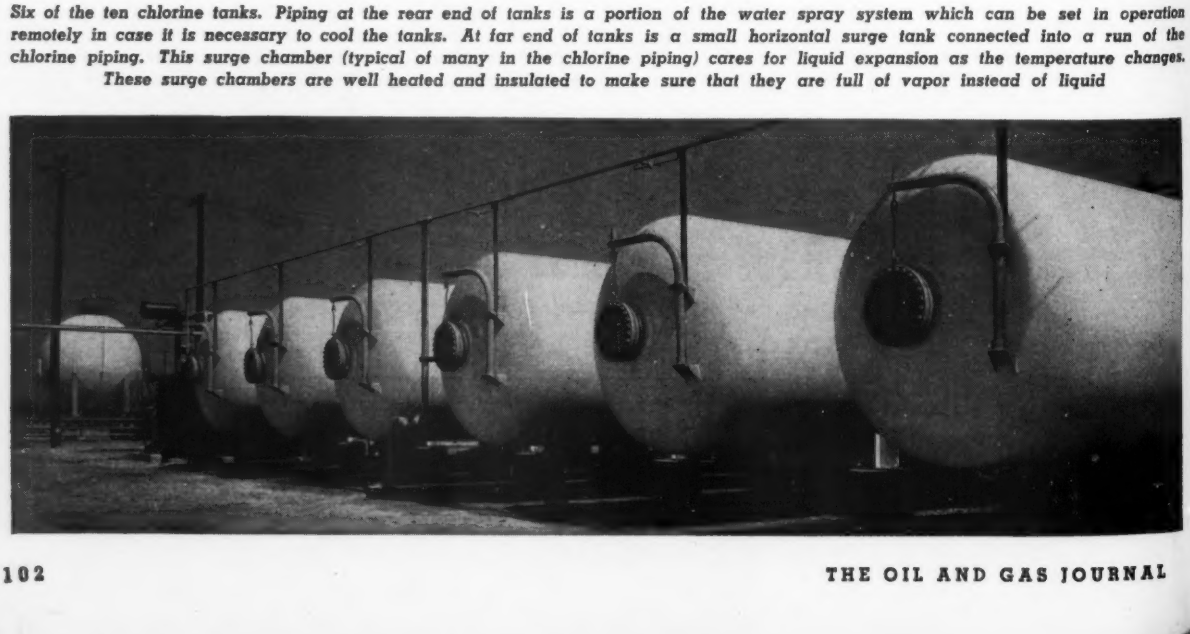
The unit produces three main streams of product: (1) a purified ethylene stream, (2) a distillate stream high in aromatics, and (3) a hydrocarbon polymer stream. The unit producing ethylene oxide and ethylene glycol was designed in the basis of extensive research work carried out in the company's pilot plant located in the Texaco refinery at Port Arthur. The products formed here are mainly ethylene oxide, ethylene glycol, polyethylene glycol (largely diethylene glycol) and crude ethylene dichloride. The dichloride is purified by drying and redistillation in a separate unit, as the raw product contains considerable quantities of byproducts of higher chlorinated hydrocarbons.

Water for all plant processing is taken from the canal of the Lower Neches Valley Authority nearby, and is pumped into an 18,000,000-gal. reservoir. Water destined for domestic uses and for processing is treated with soda ash, clay, and alum to coagulate and settle suspended matter; it is chlorinated and caustic treated, and finally filtered to fit it for use. Water for steam making is softened chemically after undergoing the same treatment shown above.

Since large quantities of chlorine are employed in the plant's processes, this chemical is purchased in tank cars and stored in tanks in the plant tank-storage farm. By piping chlorine to the water unit for treating the plant water, from these large tanks it was found that considerable savings were made over the cost of buying and handling chlorine in drums in the conventional manner for water treating, even after building the long line from storage to water purifying plant. Waste heat from an operating unit vaporizes the chlorine as it leaves the storage tanks; cylinders of chlorine are kept only as emergency equipment.

Power is supplied by Gulf States

Six of the ten chlorine tanks. Piping at the rear end of tanks is a portion of the water spray system which can be set in operation remotely in case it is necessary to cool the tanks. At far end of tanks is a small horizontal surge tank connected into a run of the chlorine piping. This surge chamber (typical of many in the chlorine piping) cares for liquid expansion as the temperature changes. These surge chambers are well heated and insulated to make sure that they are full of vapor instead of liquid



Utilities Co., coming to the plant at 33,000 volts, reduced to 2,300 volts in a substation, later reduced in the plant to 440 and 110 volts for various purposes. Large motors operate on 2,300 volts directly and most of them are synchronous, resulting in a high power factor for the whole plant. Three boilers rated for 625-lb. operation are installed, operating now at 175 psig. When turbogenerators are installed later the steam pressure will be stepped up to 625 psig.

Boiler, deaerator heaters, and forced and induced-draft fans are outdoors. Only the firing aisles, feedwater pumps, and instrument boards are housed. A phosphate treating system is used to reduce scale.

Steam, air, condensate, and chlorine vapor lines throughout the plant are supported by concrete piers except in crossing roads or railroads where they are supported overhead. This arrangement results in lowered maintenance costs and facilitating access to the lines.

Fire protection is provided by one steam-driven and one motor-driven fire pump located near the water reservoir. A 10-in. main leads from the pumps, ending in an 8-in. loop serving the process and storage areas. Several foamite and hose-cart houses are located strategically, and a number of monitor nozzles, operable by one man, are placed for best protection of equipment. Fire-hose nozzles are combined fog and stream type, which are especially effective in fighting hydrocarbon fires. Carbon dioxide extinguishers are placed throughout the plant, and a main fire house holds foamite, chemicals, a foamite generator, asbestos clothing, and other needed equipment.

Two tank-car racks are provided. At one liquid chlorine is unloaded; and at the other, finished products are loaded for shipment. The chlorine is unloaded by placing 175 psig. dry air pressure on the tank cars, forcing the chlorine into 10 storage tanks. Automatic shutoffs close the valves when the tank cars are empty, and ring a bell to warn the operator. On the tanks reflex-type gage glasses are used and high-level alarms are installed on each tank. A double relief-valve system is installed on each tank, including two shutoff valves, two frangible disks, and two relief valves; shutoff valves are interconnected so that when one is closed the other must remain open.

Laboratory Wing

The laboratory is of two-story, concrete construction, the second floor now used for offices, temporarily. Flat, concrete slabs are used for second floor and roof, with brick and tile walls, between which is placed an asphaltic waterproof membrane to eliminate dampness from heavy rains.

Warm air is used for heating the building and space for summer air-conditioning equipment is provided.

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by the

"BACK-OFF" Controlled Explosive METHOD

(Patent No. 2305261)

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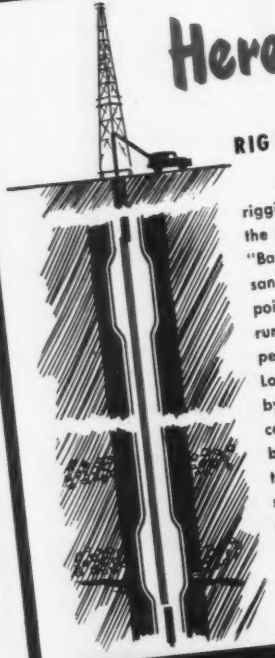
Takes only 1/5th the time of cut-and-pull or other methods!

One of the most outstanding developments for recovery of stuck drill pipe, drill collars and tubing is the "Backing-Off" or unscrewing of any designated joint through combined application of reverse torque and a hammer-like shock delivered by a predetermined explosive charge detonated within the joint to be backed off.

Placed in service in 1945, and since that time completing over 800 successful recovery jobs at all depths—from surface to over 13000'—in California and portions of the Rocky Mountain and Mid-Continent areas, the "Back-Off" method of recovery is fast becoming standard procedure to majors and independents alike. Its record is a material saving of at least 1/5th in rig down-time, the elimination of rental and high transportation charges common with conventional cut-and-pull tools, and the elimination of cost for replacing drill pipe and drill collars damaged by other methods of recovery—the "Back-Off" Controlled Explosive method of recovering drill pipe may be performed without loss or damage to drill pipe, tool joints or drill collars!

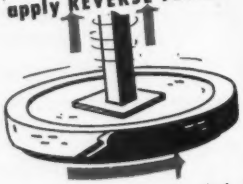
Here's how it's done...



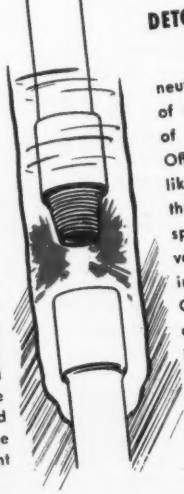
RIG UP AND RUN IN

After spotting truck and rigging up running sheaves, the multiple length string-type "Back-Off" shot is lowered at sand line speed to the desired point. The "Back-Off" shot is run in on a regular steel wrapped electric conductor cable. Lowering speed is controlled by the weight of the mud, viscosity of fluid and depth of the back-off point. It is interesting to note that the "Back-Off" shot does not damage the conductor cable.

NEUTRALIZE WEIGHT apply REVERSE TORQUE



After "Back-Off" shot is spotted within the joint to be backed off, the drill string weight is neutralized at the point to be unscrewed and reverse torque is introduced into the drill string at the rotary table. The amount of reverse torque applied is dependent upon drill pipe size and total depth to desired point of back-off.



DETONATE AND BACK-OFF

With drill string weight neutralized and under tension of reverse torque, detonation of the non-damaging "Back-Off" shot delivers a hammer-like shock to start the tool joint threads and thus permit joint to spin out from action of the reverse torque previously placed in the drill string. The "Back-Off" method not only cuts recovery time to a minimum but it leaves a clean undamaged fish for continued "Back-Off" and washover operations.

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*Operated by The Ford Alexander Corporation.

"Backoff" Method Successful in Recovering Stuck Drill Pipe Without Damage

by Herndon David

AN outstanding recent development for recovery of stuck drill pipe is the backing off or unscrewing of the drill pipe with the use of explosives. Termed the "backoff" method of drill-pipe recovery, this type of operation was first placed in service in 1945. Since that time approximately 800 successful jobs have been completed in California and portions of the Rocky Mountain and Mid-Continent areas.

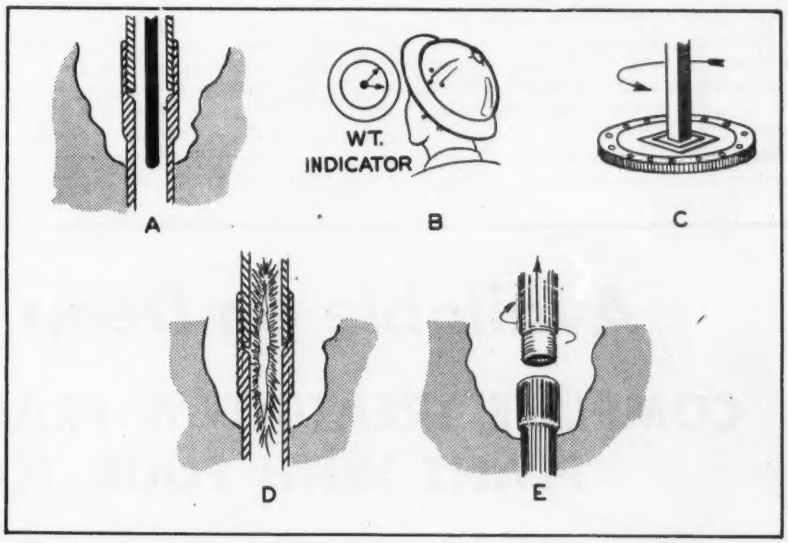
Through use of the backoff method the cost of recovering stuck drill pipe has been reduced materially. This is due to several factors. Primarily the time involved for recovery by this method is very short when compared to cutting and fishing, thus resulting in major savings in rig time. Second, no additional equipment is required and equipment rentals and transportation charges are minimized. Also, the drill pipe may be backed off without damage to either the pipe or the tool-joint threads thus eliminating the usual pipe-replacement expense.

The actual backoff operation is very simple, and in principle is the same as striking a fruit jar lid a sharp blow with a knife handle to loosen it sufficiently to be unscrewed. After determination of the depth at which the pipe is stuck and at what depth above the stuck point it is desirable to unscrew the pipe, a ribbon-type shot ¾ in. in diameter is run into the hole.

This explosive core may be run in any length: If the joints of pipe are 30 ft. in length, a shot 35 ft. in length is run. If 40-ft. joints are used, a 45-ft. shot is used. Thus there is no question that the shot will lapse at least one tool joint, and the problem of finding a joint is eliminated. The shots may be run into the well on a regular electric conductor cable similar to that used for gun perforating, electric logging, or tubing surveys—and lowered to any desired depth above the stuck point.

Proper weighing of the drill pipe is then necessary in order that the pipe at the point to be loosened will be neutral; that is, the pipe at that point is neither in tension nor compression. Reverse torque is then placed and held in the drill pipe through use of the rotary table, thus giving it a tendency to unscrew. The shot is then detonated and the concussion from the explosion is similar

Fig. 1—(Below) Backoff shot is run into hole to desired depth on any normal well shooting, tubing survey, or gun-perforating line. Shot is ¾ in. in diameter and is run in any desired length. If 30-ft. joints are used a 35-ft. shot is used, and if 40-ft. joints are used a 45-ft. shot is run. Thus shot must lap at least one tool joint and problem of finding a joint is eliminated



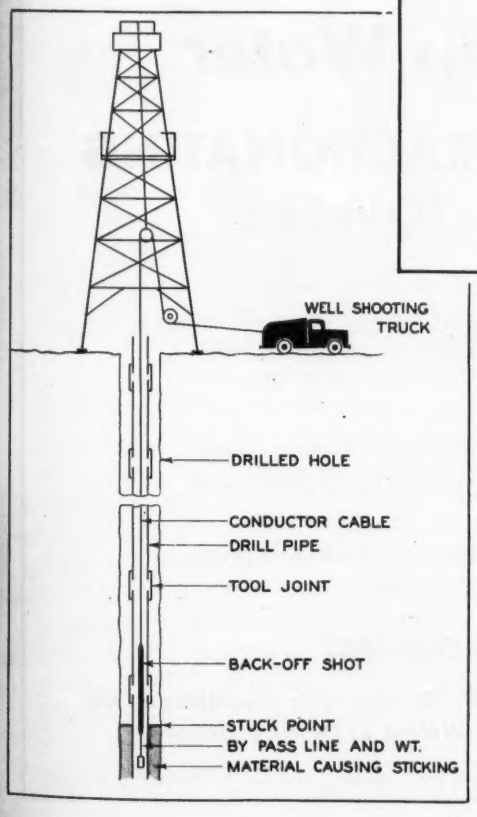


Fig. 2—(Above) Backoff method of drill-pipe recovery

A.—Shot is lowered to desired depth so that it extends above and below tool joint to be loosened

B.—Tension is placed on drill pipe so that weight at point to be loosened is neutral

C.—Left-hand torque is placed in drill string with rotary table

D.—Backoff shot is detonated so that concussion will break joint. No damage to drill pipe results

E.—Left-hand torque in drill string spins joint out after backoff shot has loosened it. String above stuck point then may be pulled

to hitting the tool joint a hard blow causing it to "break" and, thereby permitting it to be unscrewed easily.

An important feature of the backoff shot itself is its small diameter. A ¾-in. diameter permits the shot to be run through openings as small as 1 in. in diameter, or through a set of jars, bumper subs, fishing tools or small-diameter drill pipe where no other tools could be run. It has become a common practice to run the shot through fishing tools that have "grabbed" a fish but have been unable to jar it loose.

Another feature is the fact that drill collars may be backed off and recovered, an operation that is impossible to accomplish through use of cutters. When several drill collars are used in a drilling string that has become stuck, the fishing job is, therefore, materially shortened. An interesting backoff job in this connection occurred at Richfield Oil Corp. 1 Mullis, near Artesia, N. M. A string of 3½-in. drill pipe and 12 drill collars were being employed in this well for drilling when the string became stuck at the bit at a depth of 11,850 ft. Backoff shots were run successfully to total depth and drilling was resumed within 4 days although the nearest service point was 1,200 miles distant.

Since its introduction, the backoff method has been employed successfully on all sizes of drill pipe, drill collars, and tubing. One successful job during the early part of 1947 was in what was then the deepest well in the world, Pacific-Western Oil Co. 1 National Royalties, located in the Lost Hills area of Kern County, California. This well was drilling at a total depth of 16,669 ft. when the drill pipe became stuck. After determination of the stuck point, a number of consecutive backoffs were made and pipe recovered to a point below 13,000 ft. Dut to the small size of drill pipe and casing used in this well, the only alternative to the backoff method would have been the use of inside cutters, a time-consuming and difficult operation.

An unusual job demonstrating the effectiveness and rapidity of recovering drill pipe by the backoff method was performed recently at Mountain Fuel & Supply Co. 2 Church Buttes, near Church Buttes, Wyo. This well was drilling at 11,300 ft. when drill pipe become stuck. Tests proved the pipe to be frozen at a depth of 5,740 ft. A backoff shot was then run to this depth and the pipe backed off. Further recovery was accomplished by washing over and backing off the drill pipe in stages of approximately 300 ft. to a depth of 8,045 ft. At this depth it was found that the pipe was free and drilling was resumed. This entire fishing job was accomplished by exclusive use of the backoff method, and required only 16 days despite the well was remotely located.

Recover 13,000 Ft. of Drill Pipe

Deepest well on which a backoff shot has been used was Standard Oil Co. of California 1 Maxwell, a wildcat located near Montalvo, Calif. The 1 Maxwell had reached a depth of 17,696 ft., a record depth for California, when the 3½-in. drill pipe became stuck at an unknown depth. Backoff shots set off successfully at 16,000, 15,500, and 14,700 ft. failed to loosen the pipe, and a nitroglycerin shot was run to a depth of 14,000 ft. This latter shot proved the pipe to be stuck above 14,000 ft., and another backoff shot was subsequently run to 13,000 ft. This shot proved successful and all pipe to 13,000 ft. was recovered undamaged.

Only limitation to the backoff method is that it can be used only on those wells where it is possible to put reverse torque in the stuck string. After many months of successful use, however, this new method has been adopted as common practice in California, and its use is rapidly spreading to other active oil areas.

This drill-pipe-recovery procedure has been developed by Dia-Log Co. and Ford Alexander Corp., who are operating the service in California, Wyoming, Texas, Arkansas, Oklahoma, and Kansas.

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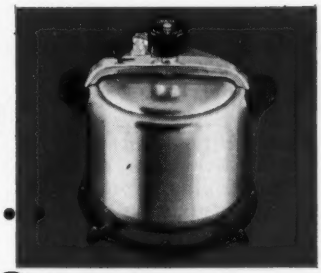

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4. *Has good physical properties such as: (a) high tear resistance, (b) good tensile strength, (c) good elongation.*
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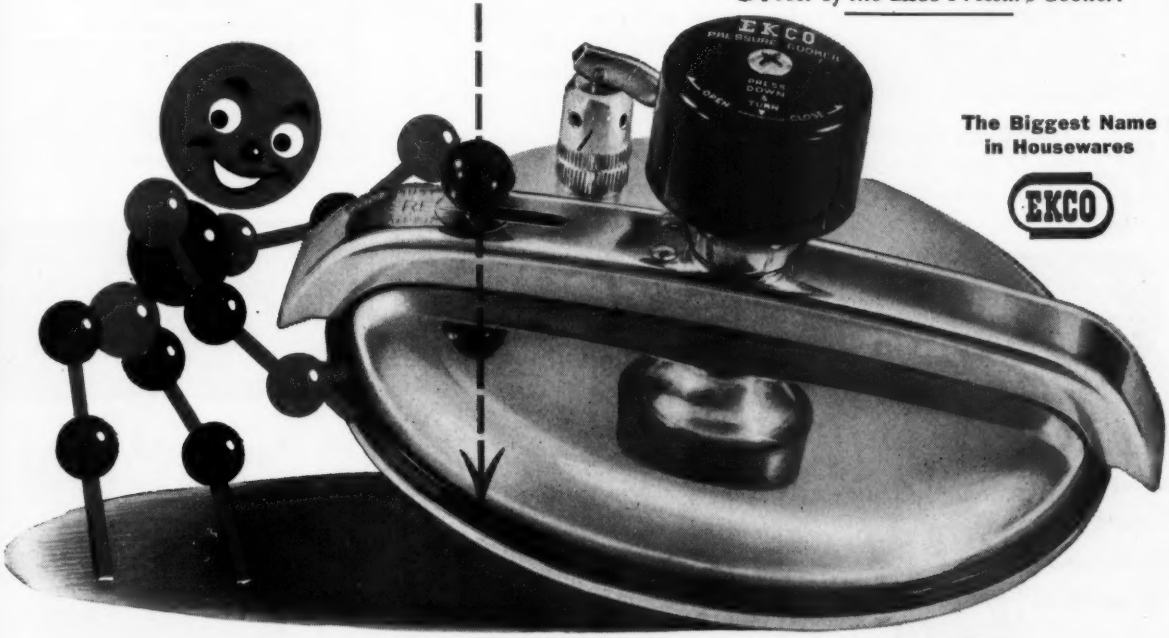

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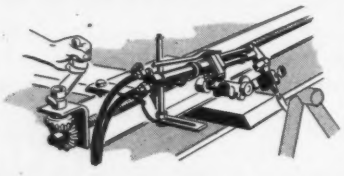

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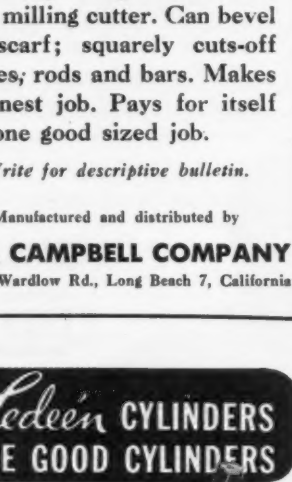

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Relation of Nozzle Fluid Velocity

(Continued from page 99)

at bit weights below the balling-up point, rate of drilling is proportional to bit weight at constant speed of rotation.

4. The maximum rate of drilling with any rig can be obtained when all horsepower available for mud circulation is utilized in such a manner that a maximum value of the product of rate of circulation and bit nozzle fluid velocity is obtained. The rate of circulation so determined may be used in practice only when it is equal to or greater than the minimum rate required to produce a safe annular return velocity.

5. The use of drag-type bits having more than two blades, the use of rotation speeds greater than 175 r.p.m. and the economics of extreme nozzle fluid velocity drilling are worthy of investigation. The usefulness of much of the data presented in chart form may be extended when it is reduced to generalized equations.

References

1. The Oil and Gas Journal, Vol. 45, No. 42, pp. 147-149, Feb. 22, 1947.
2. Mud Flow in Drilling Mud by R. J. S. Pigott, presented before eleventh mid-year meeting of the A.P.I., May 21, 1941. Also Rate of Penetration in Hard Formation Drilling, by J. E. Warren and B. R. Schabarum, Mid-Continent district, A.P.I., Oklahoma City, June 6-7, 1945. Hard Rock Drilling in the Permian Basin, by David Johnston, southwestern district, A.P.I., Fort Worth, Mar. 27-28, 1947.

Compounded Power Pumps Drill

(Continued from page 71)

stant later, when the discharge rate of the low-pressure pump becomes less than that required by the high-pressure pump, fluid will be forced into the line by expansion of the air to make up this deficiency.

In order to obtain some idea as to the type of performance that could be expected from a cutout valve or piston, a discharge valve was removed from the low-pressure pump. There was a substantial pressure drop in the system with a resulting unbalance of load between the pumps. The high-pressure pump engine automatically adjusted itself to run at reduced speed, due to the additional load, while the low-pressure pump engine speed increased. Equilibrium was attained with the low-pressure pump carrying approximately 30 per cent of the load and the high-pressure pump carrying 70 per cent. In another instance the low-pressure pump piston-rod stuffing boxes were allowed to leak and similar results were obtained.

The laboratory results proved quite significant and substantiated the theory of series operation.

Superior Oil Field Test

Having completed this foundation work National Supply arranged a test with the Superior Oil Co. to prove the practicability of compounding in the field. The capacity of the low-pressure, (or compounding) air chamber for field application was based on the laboratory test results. A ratio, of air volume at rated pump pressure to maximum fluid volume absorbed during a cycle, was established as a basis for good performance in series operation.

Boyle's law was applied in the following formula to determine chamber size at atmospheric pressure:

$$V_c = \frac{V_d \times P_r \times R}{P_a}$$

V_c = Volume of air chamber at atmospheric pressure.
P_a = Atmospheric pressure
V_d = Maximum differential volume to be absorbed during a cycle.
P_r = Rated pump pressure.
R = Ratio of volume occupied by air at pressure P_r to V_d.

The compressibility of fluid is not taken into account in the above formula, although it is recognized to be

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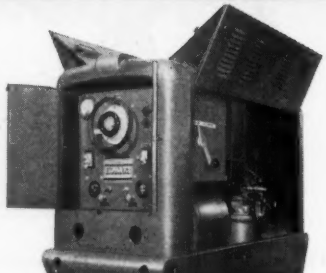

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of some importance when considering large atmospheric chambers. The following expression was found to be satisfactory in approximating the pressure variation:

$$\text{Per cent pressure variation} = 100\ (1/R)^{.875}$$

This formula is simply a method of determining air-chamber performance. The optimum value of R is difficult to state at this time. It is thought that an R value of 3 is sufficient for marginally satisfactory series operation.

For the field test an R value of 5 was selected, calculated to produce a pressure variation of approximately 25 per cent. This also provided possible capacity for air absorption, mud caking, and other contingencies which did not occur on test.

This required a 43-cu. ft. air chamber between pumps. Although not essential to series operation the same size air chamber was also provided for the high-pressure discharge line. This not only reduced pressure fluctuations but, more important, it reduced variations in the load on the high-pressure pump which may be out of proportion to the pressure change.

As briefly discussed in the beginning of this article, very good results were obtained in the series operation of the two C-350 pumps when using air chambers. The pressure card of Fig. 2 was typical of the recordings made at various depths during the drilling of the wells. Corresponding to this card, the speed of the low-pressure pump was 47 s.p.m. and the high-pressure pump was 45½ s.p.m. This difference varied from ½ to 4 s.p.m. as a result of volumetric efficiency differences and created only a moderate increase in the pressure variation.

It is interesting to note that the series operation of these power pumps was more satisfactory from the standpoint of minimum fluctuations in pressure and smooth pump performance than steam pumps in series, or conventional power pumps.

Credit should be given to others who have investigated the series operation of power pumps and who have operated them experimentally with some success. The real contribution of this development is thought to be a more thorough analysis of power-pump operation made possible through laboratory facilities and bringing to series operation the last few, but most important steps, from the experimental stage to full practical realization.

These developments open new fields for power-pump operation. It is obvious that the principal application will be on the deep wells of the future which will require higher pressures and greatly increased hydraulic horsepower. This in turn removes the limitations of internal-combustion engines for the largest rigs.

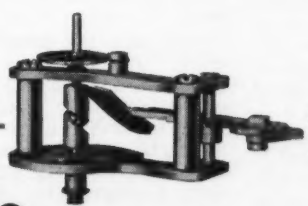
When ordinary pressure gages are used on corrosive sour oil or gas, they last only 5 to 6 weeks. That's what one company* found. Then they tried Helicoid gages with K-Monel tubes.

After 55 weeks, they were removed for inspection. There were no signs of corrosion. The gages tested accurate and were put back in service.

This is a typical case proving how money is saved by using Helicoid Gages. There are countless other examples.

For better gage value for any kind of service, insist on Helicoid—the gage of enduring accuracy.

*Name on request



Only Helicoid Pressure Gages have the Helicoid Movement

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE
Bridgeport 2, Connecticut

TRADE MARK

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Blending Viscous Oils

The blending of viscous crude oil or fuel oil (Furol at 122° F.) with gas oil (Universal at 100° F) is tedious and complicated because the viscosities must apparently be converted to centipoises and then after obtaining the viscosity of the blend in centipoises, to convert it back to Furol. Can you suggest a simpler method so that plant or pipe-line operators can prepare such blends?—J.B.

Our suggestion is that you go through a number of your complicated computations covering the ranges of viscosity and stocks encountered by your men, putting the results in the form of mimeographed tabulations which can be posted. Of course, they will need to be revised or extended at intervals.

All viscosity-blending charts and methods require that the viscosities of the blending stocks be taken at the same temperature and in the same units of viscosity. Thus, if the viscosities of the base stocks are determined at different temperatures, as in your situation, it is necessary to convert one of the viscosities to the same temperature as the other, and in turn, this requires a knowledge of the viscosity index or rate of viscosity change of the stock with temperature. This automatically rules out any simple accurate relationship for handling situations such as the one you encounter.

Perhaps the easiest thing to do would be to change the test temperature for the gas oil from 100° to 122° F. By noting that the Furol viscosity is almost exactly one-tenth the Universal viscosity (at the same temperature), the viscosity of one or the other of the stocks can be converted to the same units of viscosity as the units of the other stock. It is then possible to use any of the customary viscosity-blending methods or charts which apply to such units of viscosity.

Example.—Suppose your viscous oil has a Furol viscosity of 450 at 122° F. Its Universal viscosity at 122° F. will be approximately 4,500 (*Viscosity by Different Instruments—High Range, Refiner's Notebook No. 130, The Oil and Gas Journal, February 8, 1947, page 99;* or Petroleum Refinery Engineering, second edition, page 44, McGraw-Hill Book Co., Inc., New York, 1941).

If the viscosity of the gas oil or cutting stock is 50 seconds Universal at 100° F. or 44 seconds Universal at 122° F. The viscosity at 122° F. could be estimated with fair accuracy for a particular type of stock if a laboratory determination were not available (*Viscosity at Pipe-Line Temperatures, California Oils, Fig. 6, The Oil and Gas Journal, January 12, 1946, page 87*).

The viscosity of the blend (Universal at 122 °F.) could then be determined by means of the A.S.T.M. blending charts (Petroleum Products and Lubricants, A.S.T.M., 1916 Race Street, Philadelphia 3) or other such charts, such as the Wilson charts (Petroleum Refinery Engineering, second edition, page 120, McGraw-Hill Book Co., Inc., New York 1941). The Universal viscosity so obtained would be divided by 10 to obtain the Furol viscosity.

In summary—

1. Multiply the Furol viscosity by 10.
2. Determine viscosity of blend, being sure that the viscosity of the stocks is stated at the same temperature.
3. Divide the blend viscosity by 10.

Uses of Carbon Black

What are the uses of carbon black other than for tires? F. R. M.

Many of the uses of carbon black are tabulated below (W. H. Cadman, Modern Petroleum Technology, page 350, Institute of Petroleum, Manson House, 26, Portland Place, London, W. 1., 1946).

Electrical industry.—Arc electrodes; battery plates; brushes and electrodes; insulating covers for ropes, wires, cables, etc.; radio tubes; resistors; for dry cells acetylene black now holds a leading position; accumulators.

Inks and the printing industry.—Book and magazine inks; carbon paper; carbon inks; Chinese stick ink; engraving inks; finger-print inks; India inks; drawing inks; job inks of all sorts; lithographing, offset, halftone inks; metallic black ink; news ink; photogravure; quick-set inks; rotogravure; rotary stencil, duplicating, mimeographing inks; stamp-pad inks; tattoo ink; typewriter ribbons.

Latex.—Latex compounding; linoleum; paper impregnation (artificial leather).

Paper.—Album; bag; black and grey impregnating paper for the insulating materials of high-voltage electric cables; bookbinders board; cardboard, panelboard; coated, glazed paper; photographic; resin and latex-impregnated paper and board; typewriter carbon paper; wallpaper.

Pigments for paints, varnishes, lacquers.—Air-dry enamels; alkyd enamels; all types of lacquers; artists' colors; baking enamels; house paints; industrial paints; oil colors; screen and sash paints.

Plastics.—All types including transcription and phonograph records; gramophone records.

Rubber.—Boots; footwear of all sorts; hose, pressure tubing; mechanical goods of all sorts; tarpaulins; tires; wires and cables; bathing caps.

Rubber (hard).—Batteries; earphones; imitation bone handles; instruments.

Miscellaneous.—As an aid in grinding cement clinker; blackboard stock; brake-shoe composition; case hardening of steel; cement—gray cement, bricks, tiles, artificial stone, pavements, magnesia and sulfur cements; colored concrete (to make concrete highways and airport runways grey and so deaden the glare of the sun's rays. This makes driving more comfortable and reduces the risk of accidents); coloring glass; crayons—colored chalk, finger paint, pencils, water paint, etc.; dusting sulfur and fungicides; explosives (with liquid oxygen); fertilizers; flooring materials (rubber and linseed-oil bases); leather finishes; metallurgical uses—reducing agent, tungsten-carbide alloys, etc.; rayon-acetate, viscose, cuproammonium, etc.; shoe and stove polish; thawing ice on frozen inland waterways, e.g., in Alaska; chocolates.

Kinds of Distillate Fuels Marketed

What are the kinds of distillate fuels sold, or how much of each kind? —F.R.S.

Little information is available but the general situation can be judged from the following tabulation of burner types and the grades of fuel oils required or used for each type of burner:

	Per cent of sales	A.S.T.M. grade of fuel required
Vaporizing-type burner	10.8	.....
Natural draft	...	1
Pot type, forced draft	...	1 or 2
Vertical rotary, forced draft	11.0	1 or 2
Vertical rotary, atomizing	...	1 or 2
Atomizing gum type		
Low pressure	6.2	3 or 2
High pressure	71.7	2 or 3

This indicates most generally that A.S.T.M. No. 2 Grade is probably most widely used, with No. 3 following closely.

Use of Capillary Pressure Curves —Original Field Distribution

THE relationship between water saturation at any point in a porous body and the capillary pressure at that point is known most frequently as the capillary-pressure curve. Since the capillary pressure must vary with height above the free water table in a porous section, the capillary-pressure curve expresses also the relationship of water saturation to height above the free water table. Fig. 1 shows a typical curve. As discussed in previous Engineering Fundamentals, any point on this curve represents an equilibrium condition.

The principal uses for the capillary-pressure curve depend upon the concept of the following sequence of events having occurred during the past history of a reservoir. First, it is assumed that the reservoir was originally filled with water. Second, this water was displaced by the oil which accumulated in the reservoir. Third, displacement of the water was not complete, but rather sufficient water must have been retained to satisfy the capillary forces. Fourth, today, upon discovery, the reservoir exists with amounts of water and oil equal to those required by an equilibrium between gravitational and capillary forces, geologic times having sufficed to insure equilibrium between phases in the reservoir. In other words, the distribution of original connate water in a reservoir is said to be equivalent to that shown by the capillary-pressure curve.

This concept of connate water being distributed in a reservoir at discovery according to the condition of capillary equilibrium is used in petroleum technology to explain several practical observations long recognized as a matter of common experience. One example was the observed condition that no sharp line of demarcation existed between oil and water levels or between oil and gas levels in a reservoir. Reference to Fig. 1 shows a depth interval within which the saturation changes from 100 per cent water to 20 per cent water gradually. This is referred to as the "transition" zone, which zone must exist in any reservoir where there is a bottom water table. The water-oil contact cannot, therefore, be said to exist at a definite depth, but rather within a range of depth. The thickness of the transition zone depends on the individual fluid and porosity characteristics of each reservoir. In general, less-permeable sands are expected to have a greater transition zone, although the thickness of the zone is more a function of the internal pore-structure arrangement rather than of the permeability constant.

The reservoir section above the oil-water transition zone is said to be the region of irreducible water saturation. It is so called because the water saturation has been reduced to an amount below which it cannot be taken without excessive pressure gradient. The value of irreducible water will not be strictly a constant because the curve is not exactly vertical. It is deduced that this value of water saturation represents the connate water in the pay section of the reservoir. The observed fact that connate water does exist within some reservoirs without being produced is explained by this concept of irreducible water saturation. That is, capillarity holds it in place and flow differentials will not remove it. Connate water in transition zone can be removed by flow.

Just as a transition zone exists between oil and water, so a transition zone exists between oil and gas. The quantitative definition of the oil-gas zone cannot be made so readily as the oil-water because it requires a knowledge of capillary pressures when three phases (oil, water, and gas) are present, and very few data have been collected to define this behavior. It has been suggested* that the transition zone between oil and gas will be more abrupt than that between oil and water. Fig. 2 is a representation of a theoretical distribution of oil, water, and gas according to these concepts. This picture, based on capillary pressure, agrees well with observed reservoir conditions.

It is not suggested that in all reservoirs there exists a transition zone or an irreducible water zone. This would depend on reservoir pay thickness and the presence of a free water table.

*Leverett, A.I.M.E., 1941.

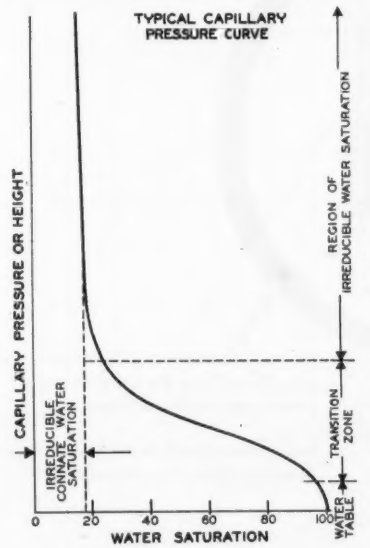


Fig. 1

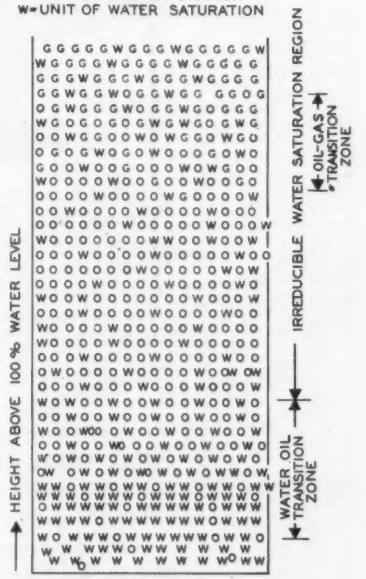
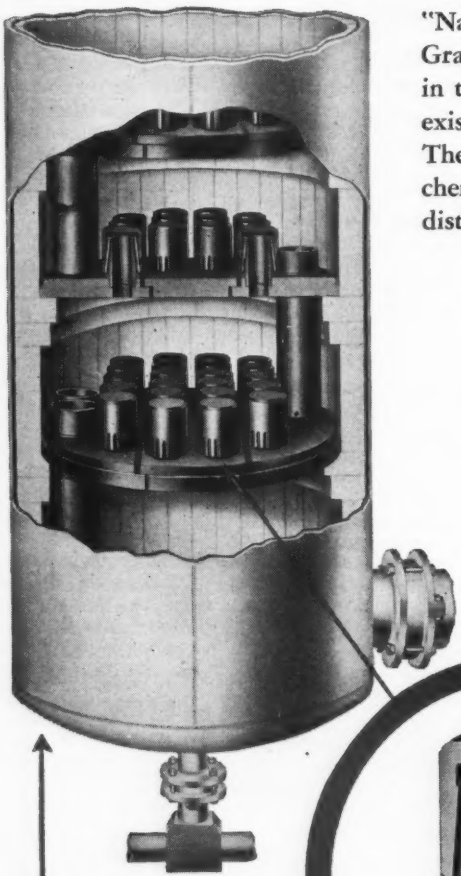

O=UNIT OF OIL SATURATION
G=UNIT OF GAS SATURATION
W=UNIT OF WATER SATURATION
HEIGHT ABOVE 100% WATER LEVEL
IRREDUCIBLE WATER SATURATION REGION
OIL-GAS TRANSITION ZONE
WATER OIL TRANSITION ZONE

Fig. 2

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma

THEY'RE ACID-PROOF AND ALKALI-PROOF!

"NATIONAL" GRAPHITE BUBBLE CAPS AND TRAYS

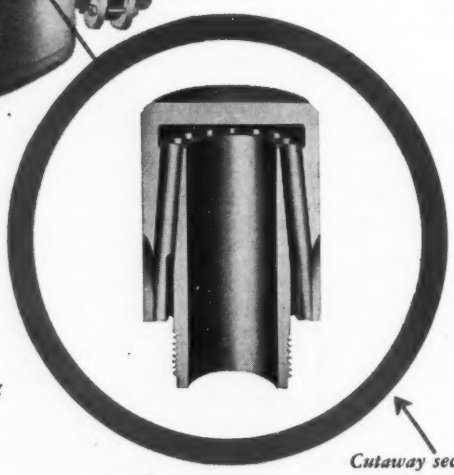


"National" Graphite and "Karbate" Impervious Graphite bubble caps and trays last equally well in towers where either acid or alkaline conditions exist or where these conditions exist alternately. They are widely used in the organic and inorganic chemical fields, in scrubbing, absorption, and distillation towers.

OTHER ADVANTAGES ARE:

1. Easier to install because of the one-piece bubble cap construction.
2. Light weight with adequate strength.
3. Highly resistant to thermal shock.
4. No metallic contamination or plugging of slots by the products of corrosion.

A typical installation of "National" bubble caps and trays in a brick-lined tower. Monolithic or fabricated trays are easily adapted to all types of tower construction, including standard "Karbate" towers.



Cutaway section of a "National" bubble cap, illustrating the exceptionally strong one-piece construction.

The terms "National" and "Karbate" are registered trade-marks of

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

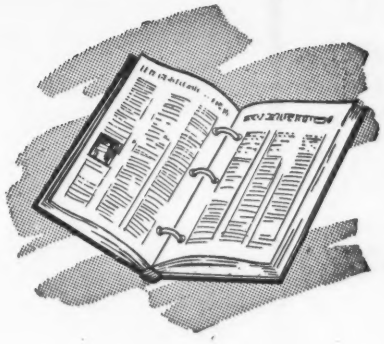
Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

These products sold in Canada by Canadian National Carbon Company Limited

FOR MORE INFORMATION ON "NATIONAL" GRAPHITE AND "KARBATE" IMPERVIOUS GRAPHITE BUBBLE CAPS AND TRAYS, WRITE TO NATIONAL CARBON COMPANY, INC., DEPT. OG

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Retiring Thickness

½-In. and 2-In. Pipe

BASIS—A.S.A. CODE FOR REFINERY AND GASOLINE-PLANT PIPING—B-31 (SECTION III)—GRADE A SEAMLESS STEEL PIPE (S = 12,000 AT 750° F.)

$$t_m = \frac{FD}{2S} + C$$

t_m = minimum thickness, in.

P = internal minus external pressure, psia.

D = actual outside diameter, in.

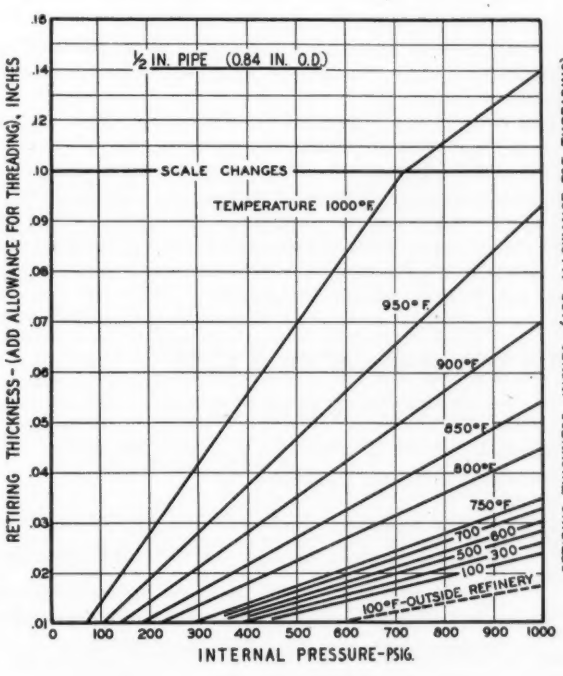
S = allowable metal stress, psi. (see tabulation of materials)

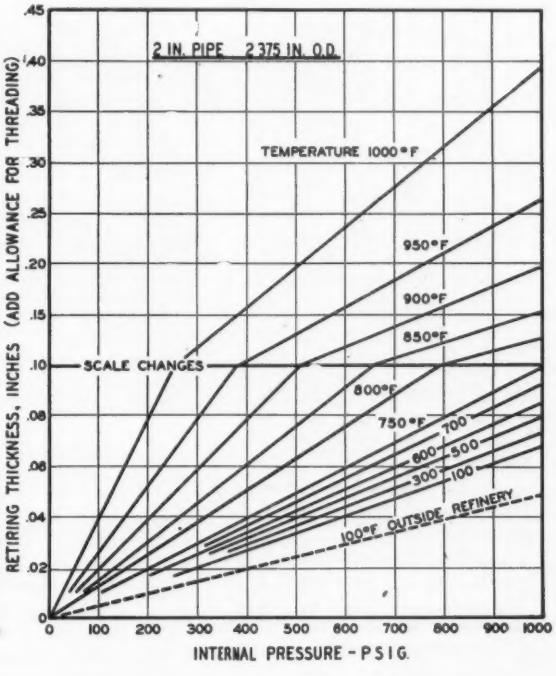
C = allowance for threading, welding, mechanical strength and/or corrosion

Values of C		
Welding		0.05
Pipe threads		
	⅛-in.	0.03
	¼-⅜-in.	0.044
	½-¾-in.	0.057
	1-in.	0.07
	2-in. up	0.10

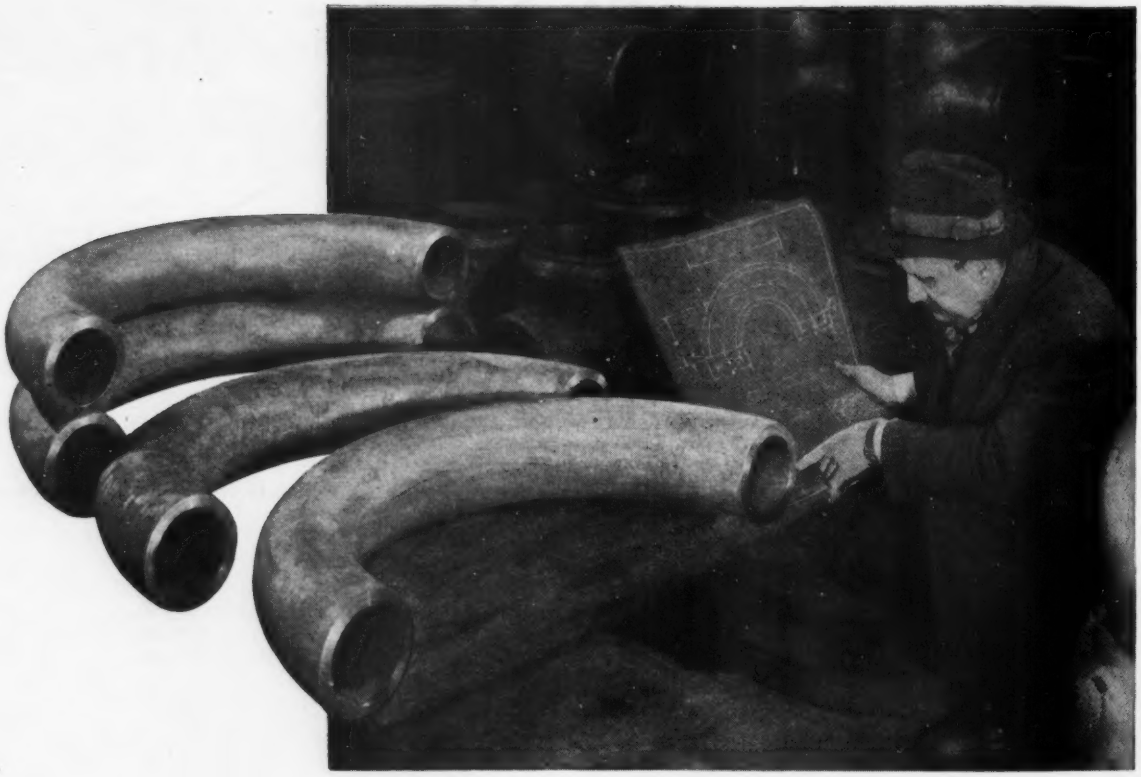
Other materials	Specification	Multiplier
Grade A seamless	A.S.T.M.-106 A.P.I.-5L	1.0
Grade B seamless	A.S.T.M.-106	.77
Grade B seamless	A.P.I.-5L	.80
Grade C seamless	A.S.T.M.-106, A.P.I.-5L	.64
Lap welded	A.S.T.M.-53, A.P.I.-5L	1.33
Butt welded	A.S.T.M.-53, A.P.I.-5L	1.60

Refer to The Refiner's Notebook No. 192 (Inspection), April 15, 1948, for a discussion of A.S.A. Code on Refinery and Gasoline Plant Piping, the effect of temperature, etc.





No. 195 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



Test your reputation at 1050° F

These Taylor Forge stainless steel return bends were manufactured recently for an extreme high temperature operation in an Eastern power plant. The double-long radius, 6-inch return bends are of Stainless Type 347 steel, in Schedule 160 wall thickness, and are the first of their kind to be made available to the power station field.

This is not the first time Taylor Forge has been identified with unusual "firsts." These fittings are operating at 1050° F temperature and 1500 pounds pressure. Naturally, the manufacture of *safe* fittings for such conditions *demands and gets* complete mastery of forging techniques, which is part of our daily job. That is why more features that count are combined *only* in WeldELLS and other Taylor Forge welding fittings. That is why Taylor Forge welding fittings, available in a wide range of types, sizes and metals, are so universally preferred for the most critical conditions.

WeldELLS *have everything*

They alone combine these features:

- **Seamless** — No question about soundness in a fitting that is forged and formed seamless.
- **Tangents** — Keep weld away from zone of greatest stress — simplify lining up.
- **Precision quarter-marked ends** — Expedite layout; insure accuracy. A constructive refinement.
- **Complete identification**—Permanent type; saves time; prevents errors.
- **Wall thickness never less than specification minimum** — Assures full strength and long service life.
- **Machine tool beveled ends** — Provides *the best* welding surface; accurate bevel and land.
- **Full line**—The most complete line of welding fittings and forged steel flanges in the world—greatest range of types, weights, sizes.

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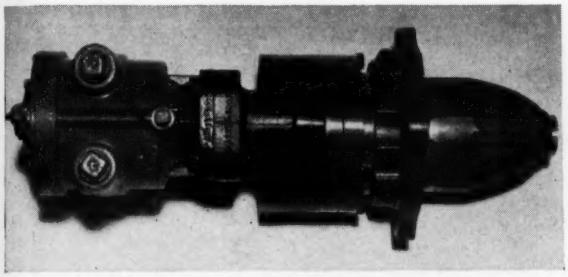
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by John M. Spears

(1) AIR-GAS OPERATED STARTER is a vane-type starter motor operating on various gas or air pressures, whichever should be available. Starter is mounted on engine in the same place as the conventional electric



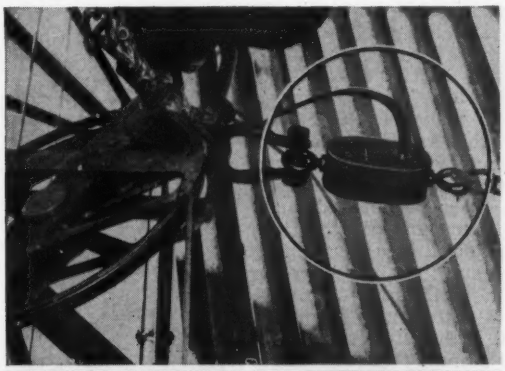
starter. It operates on pressure of 150 psi. with a volume of 20 cu. ft. in the reserve tank, and an unrestricted 1-in. line from starter to air supply. An automatic oiler is operated by air pressure and sprays a fine film of lubricating oil into the starter as the air flows through the "T," thus lubricating all moving parts. Unit is efficient on either diesel or gasoline engines. *Wahlberg-McCreary.*

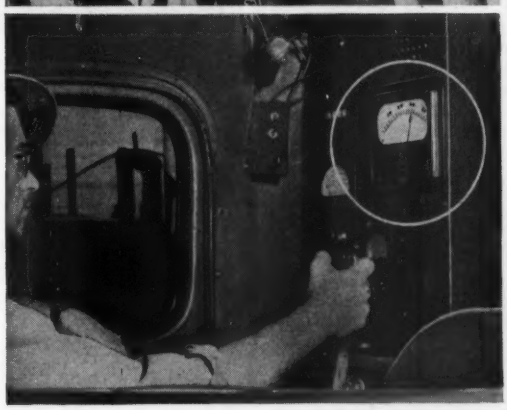
IT'S NEW CHECK IT

(2) NEW THERMAL SYSTEM is a single capillary, organic-liquid-actuated system which is particularly adaptable to applications where: (1) a small bulb is required, (2) short-range intervals are desirable, (3) the process is sensitive to mercury, (4) subzero temperatures are encountered. System utilizes a single-bore capillary and a single Bourdon with a U-shaped bimetallic compensator on the spring for case temperature changes. Uniform charts are used and the system is available with the usual fittings, armors, etc., as supplied on other thermal systems. *Taylor Instrument Companies.*

IT'S NEW CHECK IT

(3) ELECTRONIC WEIGHT INDICATOR accurately indicates any minute variation in weight. Indicator, through the application of electronics, eliminates all wearing parts, utilizes a smaller and lighter derrick unit, and enables the indicator to detect and locate fluid level, collars, tight places in pipe, liner tops, well bottoms, or any obstruction that may be in the hole. When run in combination with the gun perforators, Magna-Tector, collar locator, bridging plug, or surface-recording bot-





tom-hole-pressure bomb and gun-tester combination, the weight indicator is placed between the bail of the derrick sheave and one of the tieback chains, as shown in the illustration. An electric conductor cable connects the derrick unit of the weight indicator to the meter in the

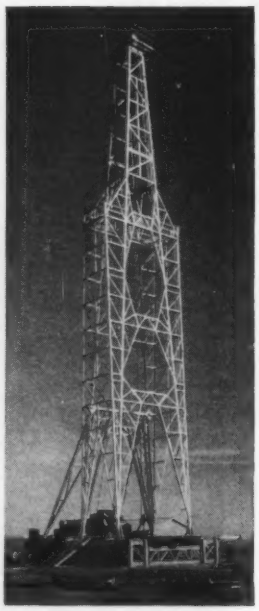
The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

service truck where the most minute variation of weight is visibly transmitted to the operator. *McCullough Tool Co.*

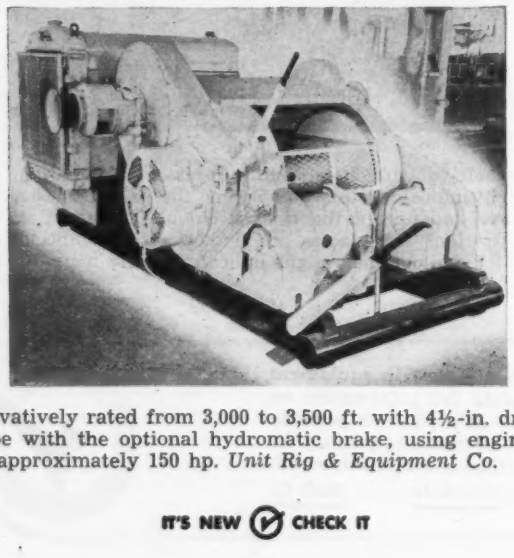
IT'S NEW CHECK IT

(4) NEW PORTABLE MAST for deep drilling operation is the bulge type. New mast may be equipped with either one or two bulges. The double-bulge construction is advantageous when the mast is barge mounted for workover operations on water locations. It permits the simultaneous racking of both drill pipe and tubing. The 136-ft. height and the crown block capacity of 800,000 lb. make the portable mast comparable to standard A.P.I. derricks that have been used for drilling to depths in excess of 15,000 ft. Bulge-type portable mast permits adequate supporting of all four legs by exterior bracing thereby eliminating the need for interior stiffening members. Mast withstands 70 - m.p.h. wind with a full setback of pipe standing in the bulge. No guying is necessary. Base dimensions of 16 by 26 ft. are sufficient to accommodate the largest draw works. *Emsco Derrick & Equipment Co.*



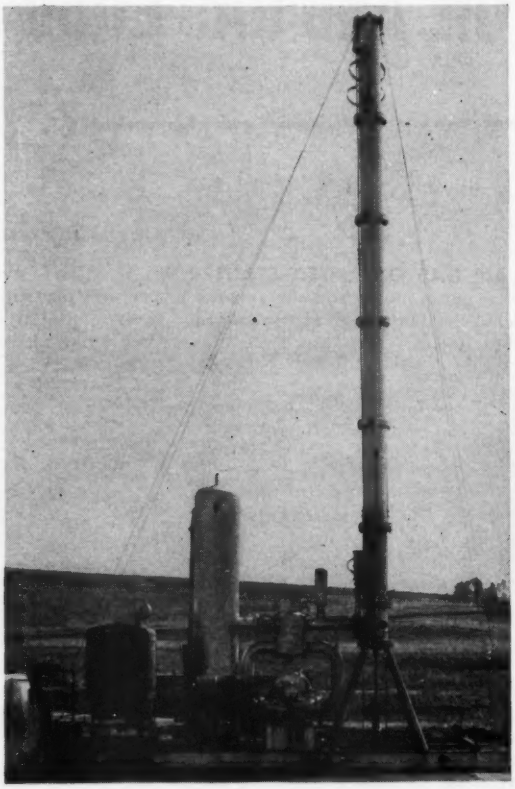
IT'S NEW CHECK IT

(5) LIGHT ROTARY RIG has ruggedness, speed, portability, and performance. Unit reduces rig-up, teardown and transportation time to a minimum. Rig is conservatively rated from 3,000 to 3,500 ft. with 4½-in. drill pipe with the optional hydromatic brake, using engines of approximately 150 hp. *Unit Rig & Equipment Co.*



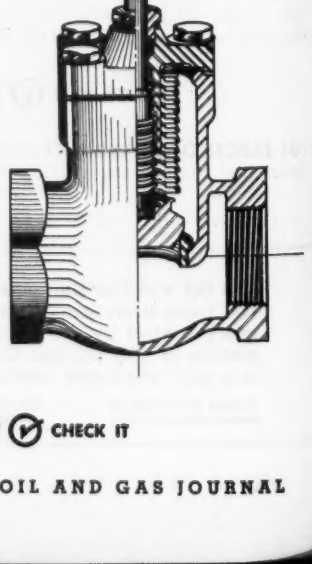
IT'S NEW CHECK IT

(6) HYDRAULIC PUMP JACK is adaptable to polished-rod loads up to 32,000 lb. and strokes of 25 ft. or longer. It features a constant load on the rods with soft, cushioned reversals and ability to pump from unusual depths without rod failure. Jack operates on a low pressure cycle, is easily portable, and simple to understand and service. Another feature is the extreme ease with which this unit permits spacing the well. *Axelson Manufacturing Co.*



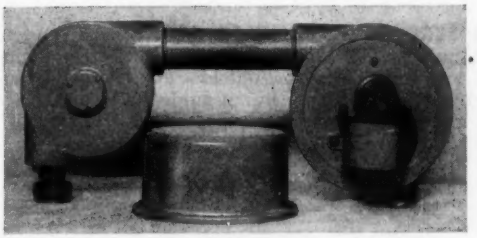
IT'S NEW CHECK IT

(7) LEAKPROOF PACKLESS VALVE owes its leakproof performance and freedom from maintenance to a seamless metal bellows which forms a leakless connection between the valve disk and the valve body. This construction enables repeated opening and closing of the valve and no maintenance is required to keep the stem absolutely tight against leakage, even under extreme conditions of pressure or vacuum. *Fulton Sylphon Division, Robertshaw - Fulton Controls Co.*



IT'S NEW CHECK IT

(8) NEW LIQUID-LEVEL GAGE is remote indicating type. Transmitter is equipped with an oil-immersed rotary switch with transmits impulses to the receiver. Transmitter is not connected to tank through pipe connections but utilizes a stainless-steel wire through packing glands. This method provides an air space between tank and transmitter, thus keeping gas in the tank and out of transmitter housing. It is especially effective where H_2S is encountered. An automatic device connects unit to battery operation upon a.c. line failure. A circuit for high and low-level signal is provided. This circuit can be used also to start and stop motor-driven pumps at predetermined levels. *Nelson Automatic Gauge Co.*

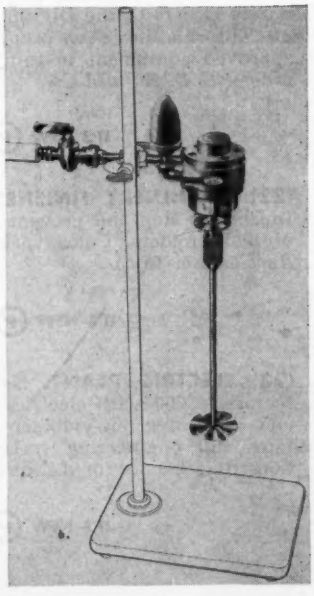


Transmitter

Receiver

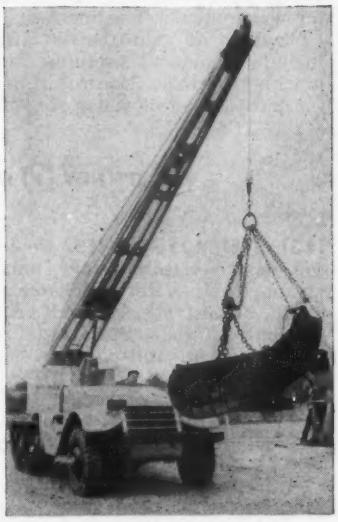
IT'S NEW CHECK IT

(9) AIR MOTOR STIRRER achieves variable speed from 0 to 6,000 r.p.m. and can replace electric motors in 0 to 1/6-hp. range. New unit cannot explode under any conditions, does not generate sparks, and more than meets all safety requirements. Recommended for pressures below 100 lb., the stirrer's variable speed can be increased or decreased by adjusting valve on the supply. Also, with four vanes acting in each revolution, stirrer will start from any position and run at moderate speeds as low as 100 r.p.m. without stalling. Size is only 2½ in. in diameter and weight is only 3 lb. Simple speed control is operated by a level-handled valve, with serrated hose included on the end of the air inlet (support arm), which controls the air pressure on the motor. Automatic takeoff has self-adjusting vanes without springs. Silent operation is assured through the compact sound muffler. *Emil Greiner Co.*



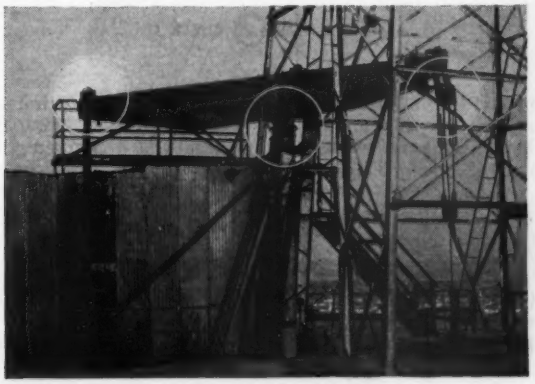
IT'S NEW CHECK IT

(10) NEW LUGGER CRANE is a versatile and mobile hydraulic unit, which lifts and carries up to 6,000 lb. Ten feet of vertical boom travel is provided, with a corresponding cable travel of 16 ft. Maximum clearance under hook is 18 ft., 6 in. Sidewise movement of the boom is limited to assure stability when handling maximum loads, even with unskilled operation. All movements of crane are readily controlled by one man from the driver's seat through a simple system of precision Daybrook hydraulics. The half-track chassis works effectively on any kind of terrain, and operates at speeds of up to 40 m.p.h. In addition to lifting and carrying, the chassis is also equipped to perform a variety of towing and pushing operations. *Day-Smith Hydraulic Crane Corp.*



IT'S NEW CHECK IT

(11) IMPROVED GRAFLUBE BEARING is a heavy-duty bearing requiring no special care and no lubrication. It does away with constant daily inspection of each wellhead installation by a pumper or maintenance man. Bearings are simple to install. The assembly for a shock-resistant, self-aligning "tailboard" or pitman stirrup bearing consists of a rugged fabricated-steel housing, an oil-resistant pad, and the bearing itself—a graphite-impregnated plastic block molded under 6,000-lb. psi. For sampson posts, beam hangers, jack plants, or pumping units, bearings are designed to fit the present holdings. *Graflube Bearing Co.*



IT'S NEW CHECK IT

TRADE LITERATURE

(12) AMMONIA IN THE PETROLEUM INDUSTRY. A 44-page illustrated booklet explains in detail the uses of anhydrous ammonia in the petroleum industry. Among applications described are corrosion control, refrigeration for wax removal, treatment of light distillates, and neutralization of acid-treated oils. Other phases covered include ammonia's usefulness in cycling, fluid catalytic cracking, corrosion control in natural-gas operations, and the purification of water gas. *Mathieson Chemical Corp.*

IT'S NEW CHECK IT

(13) STEAM TURBINES. New two-color, 16-page catalog describes single-stage impulse, double-impact-type steam turbines for mechanical drives. Casing, wheel, shaft, blades, nozzles, and bearings are treated under section entitled "Specifications." Construction details are shown in full-page cross-section diagrams. *Dean Hill Pump Co.*

IT'S NEW CHECK IT

(14) TIP-TOP TRAILERS. New development in trailer design that speeds loading or unloading is described in four-page two-color folder. Illustrations show the simple procedure of loading and unloading. *Arthur Rehberger & Son, Inc.*

IT'S NEW CHECK IT

(15) FIRE HYDRANTS AND VALVES for all water applications in refineries, natural-gasoline plants, etc., are described and illustrated in 84-page bound book. Prices and dimensions are given for each valve. Last 15 pages are devoted to useful engineering information. *Eddy Valve Co.*

IT'S NEW CHECK IT

(16) PIPE ECONOMY. Cast-iron pipe and fittings for water and gas applications are covered in 312 pages. Dimensions and weight for each fitting are given. Illustrated. *James B. Clow & Sons.*

IT'S NEW CHECK IT

(17) SMALL DIESELS. New 18-page 2-color bulletin describes manufacturer's diesel engines. Material explains how engines operate efficiently on low-cost non-explosive fuel oil. Manufacturer's background in engine field included. *Witte Engine Works.*

IT'S NEW CHECK IT

(18) SCREW-TYPE SIMPLEX JACKS. An engineering data bulletin describes screw-type jacks for supporting and leveling tanks for outside applications. Complete specification charts, selection-guide data, and price listings are included. *Templeton, Kenly & Co.*

IT'S NEW CHECK IT

(19) ENGINEERED HYDRAULICS. New hydraulic brochure contains descriptive data valuable to anyone concerned with hydraulic design. Blueprint drawings and cross-section illustrations show design features of various hydraulic power pumps and control valves. *Adel Precision Products Corp.*

IT'S NEW CHECK IT

(20) FAN-COOLED MOTORS. A four-page bulletin describes 350-hp., 3,600-r.p.m. motor of the fan-cooled squirrel-cage induction type. Descriptive cross-section illustration shows motor parts. Standard ratings table included. *Burke Electric Co.*

IT'S NEW CHECK IT

(21) SAFETY EQUIPMENT DIGEST. To simplify the job of safety equipment selection, a digest of Petroleum Safety Orders of the Division of Industrial Safety, State of California, has been prepared. Digest specifies proper approved equipment to fulfill each requirement of the orders. *E. D. Bullard Co.*

IT'S NEW CHECK IT

(22) MACHINERY FINISHES. Protective coatings and finishes to stop and prevent rust are described in series of hand folders. Color variations included. Illustrated. *Rust-Oleum Corp.*

IT'S NEW CHECK IT

(23) ELECTRIC PLANT. New bulletin covers manufacturer's 700-watt electric plant. Literature describes and illustrates one-cylinder air-cooled model and contains full engineering specifications. Outlines applications in either a.c. or d.c. models. *Universal Motor Corp.*

IT'S NEW CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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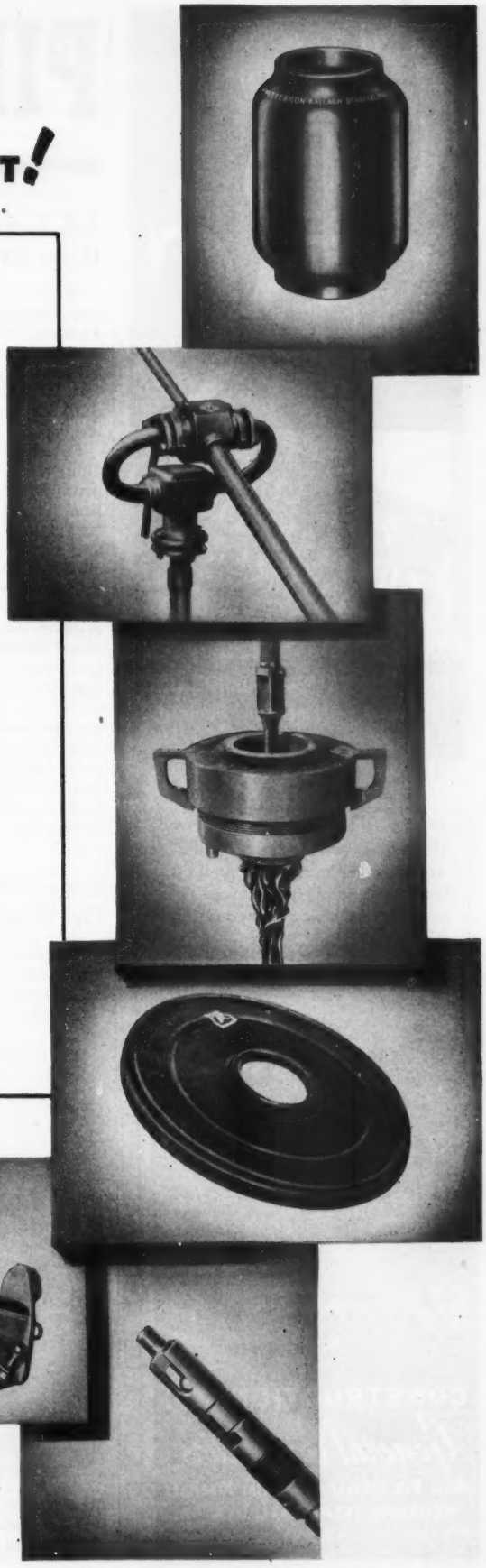

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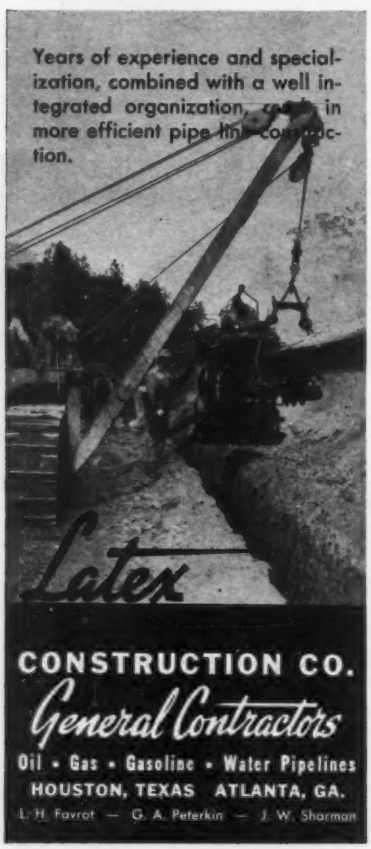
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PIPE LINES

T.G.T. Asks Approval of Huge Expansion Program

Tennessee Gas Transmission Co. has requested authority from the Federal Power Commission to construct and operate facilities to increase its natural-gas pipe-line system capacity to 1,000,000,000 cu. ft. daily, at an estimated cost of $124,354,000.

Facilities include 992 miles of loops along its existing main line and approximately 395 miles of 26-in. main line beginning in northeastern Kentucky and extending through Ohio and western Pennsylvania to the vicinity of Buffalo, N. Y.

Other proposed facilities include about 44 miles of 16-in. lateral transmission line from a point on the proposed 26-in. line in Columbiana County, Ohio, to a point in Allegheny County, Pennsylvania; about 30 miles of 16-in. lateral gathering lines to connect additional gas supply to the pipe-line system; new compressor units totaling 86,200 hp.; a compressor station with 5,000 hp. in eastern Kentucky, and check and sales meter stations on the pipe-line system.

Stanolind Completes Loops On West Texas 16-in. Line

Stanolind Pipe Line Co. put in operation last week 82 miles of 16-in. pipe laid in four loops to increase the capacity of the Slaughter, Tex., Drumright, Okla., 16-in. crude-oil trunk line from 83,000 to 100,000 bbl. daily. The loops were contracted by R. H. Fulton & Co.

Specifications will be issued this week by Stanolind for the laying of 22 miles of 12-in. to loop the company's Lost Cabin-Casper, Wyo., crude-oil line. Work is to start June 1. Only 22 miles will be available in the early stages of this project, which has been scheduled to comprise a total of 57 miles of 12-in. for the entire Lost Cabin-Casper looping. It is expected that the remainder of this looping will be laid following later deliveries of pipe, in order to achieve completion of this project in 1948.

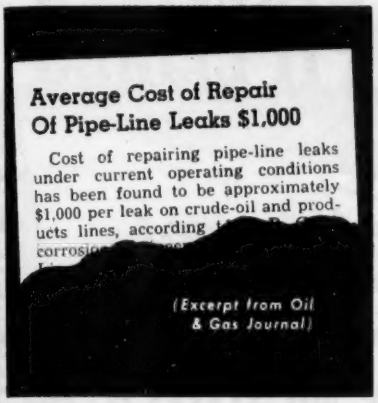
Texas Eastern Boosts Gas Deliveries 225 Per Cent

Daily deliveries of Texas Eastern Transmission Corp. during the month of April averaged approximately 310,000,000 cu. ft. of gas per day, according to the company's first-quarter report.

The increased deliveries are a result of the construction of the first 10 compressor stations on the Big Inch system. This compares with deliveries of 140,000,000 cu. ft. daily when the Texas Eastern began operations almost 1 year ago, and represents an increase of 225 per cent.

The 10 compressor stations now being completed will account for the increase, according to R. H. Hargrove,

Dope machine operating on 26-in. pipe laid near Shaw, Miss., in the looping of the Tennessee Gas Transmission Co. system. When the entire 26-in. looping program is completed the company will have a continuous 26-in. line paralleling the original 24-in. system laid in 1944


Average Cost of Repair
Of Pipe-Line Leaks $1,000
Cost of repairing pipe-line leaks under current operating conditions has been found to be approximately $1,000 per leak on crude-oil and products lines, according
(Excerpt from Oil & Gas Journal)

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PIPE LINE SERVICE

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Again, repairing steel pipe in underground service is proved to be an expensive solution to the problem of corrosion.

From the records, experience has shown that it is far more practical to protect underground lines BEFORE they are buried.

Pipe Line Service leaves nothing to chance in providing complete pipe protection service for gathering, transmission and distribution lines. Six strategically located plants furnish pipe cleaning, priming, coating and wrapping — supplying all materials and equipment to avoid any division of responsibility and relieve you of all details. Write for complete information.

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president of the company. An earned net income of $1,077,608.44 during the first quarter of 1948, and gross revenues for the 3 months ended March 31 of $6,814,935.55, were reported by Hargrove.

Other expansion plans of the Texas Eastern include 11 more compressor stations designed to bring deliveries up to 433,000,000 cu. ft. of gas daily. This project is already under way and is expected to be completed by the fall of this year.

The company has requested Federal Power Commission authorization to install additional compressor horsepower on the existing lines to bring daily delivery capacity up to 508,000,000 cu. ft. by January 1, 1949

S. S. Smith Stresses Importance of Metering

The real key to the control of product movement is accurate measuring of products entering and leaving the line, said S. S. Smith, manager of products pipe-line department, Shell Oil Co., Inc., speaking at a recent anniversary of the company's East Products Line.

The line according to Smith was the first in the country with fully automatic devices for starting and stopping pumps, regulating pressures and maintaining constant rate of flow.

Measurement of movements is recorded on a dispatching board in Shell's New York office. The arrival time of a product at any given point can be predicted within a range of 5 minutes. Takeoff points along the pipe line are equipped with specially designed metering devices enabling them to remove all or part of a tender from the line with great precision and virtually no mixing of products.

For most of its length, the line lies about 4 ft. below the surface, but it is buried as deep as 8 to 10 ft. in a few places.

Northern Natural Adds Compressor Units

Northern Natural Gas Co. has contracted the installation of compressor units at three stations, as follows: Sunray, Tex., one 1,100-hp. unit, contracted by R. H. Fulton & Co.; Ventura, Iowa, two 850-hp. units, J. F. Pritchard & Co.; Ogden, Iowa, two 850-hp. units, Fluor Corp. A 1,100-hp. unit was installed at Sublette, Kans., during the first quarter of this year.

Other units to be installed which have been authorized but not yet contracted include the following: Oakland, Iowa, two of 1,400 hp.; Mullinville, Kans., three 1,400 hp.; McConnell, Tex., two 800 hp.; Burnett, Tex., one 300 hp.

Construction of gathering lines has

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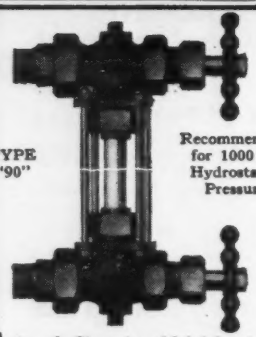
LIQUID LEVEL GAGES



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This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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PIPE LINE SURVEYS

been authorized but not contracted by Northern Natural for jobs consisting of 95.8 miles from Hugoton field, Kansas, lines and 7.7 miles of line in the Panhandle area of Texas. Diameters range from 4-in. to 20-in. for the Hugoton lines; Panhandle lines are to be 4-in. and 6-in.

Electronic Detector Finds Products Pipe-Line Leak

At a distance of 2,300 ft., leak noises were picked up by an electronic instrument used for discovering a leak in the Wyco Pipe Line Co. system at a point 20 miles north of Denver, Colo. Subsequently, by means of a bracketing procedure, the exact location of the leak was determined within a few hours.

Through a flaw in the pipe, the company had been experiencing a loss of products leaking at the rate of 3.7 bbl. daily at a normal pressure of 400 psi. in the operation of its 260 - mile Casper - Denver products system.

The electronic instrument known as the Midget Leak Detector has been developed by Fisher Research Laboratory, Inc. This instrument is easily carried because of its small size. Operation is simply a matter of touching the pipe and then listening through head phones for leak noises. The instrument has a sensitive crystal pickup which changes mechanical vibrations into electrical impulses amplified to actuate head phones or output meter or both. The instrument has been adapted to pipe line use so that it does not have a degree of sensitivity which is so high that it picks up many irrelevant noises which would affect seriously proper functioning for leak detection. It has been built so that it may be readily transported in the car of a pipe-line superintendent or foreman in the course of routine field trips.

Pump-Station Contracts Let for 182-Mile Line

Contract for the construction of two pumping stations on the 182-mile Rangely, Colo.-Salt Lake City crude-oil pipe line of Salt Lake Pipe Line Co., a subsidiary of Standard Oil Co. of California, has been awarded to Brown Lane Co., of Palo Alto, Calif. The pumping stations will be located at Rangely, Colo., and Hanna, Utah.

Pacific Pipe Line & Engineers, Ltd., has the contract for laying of the line, which has been estimated to cost $5,000,000 and will have a capacity of 25,000 daily. The line will deliver Rangely crude to a $5,000,000 refinery being built by another subsidiary, Salt Lake Refining Co., at Salt Lake City.

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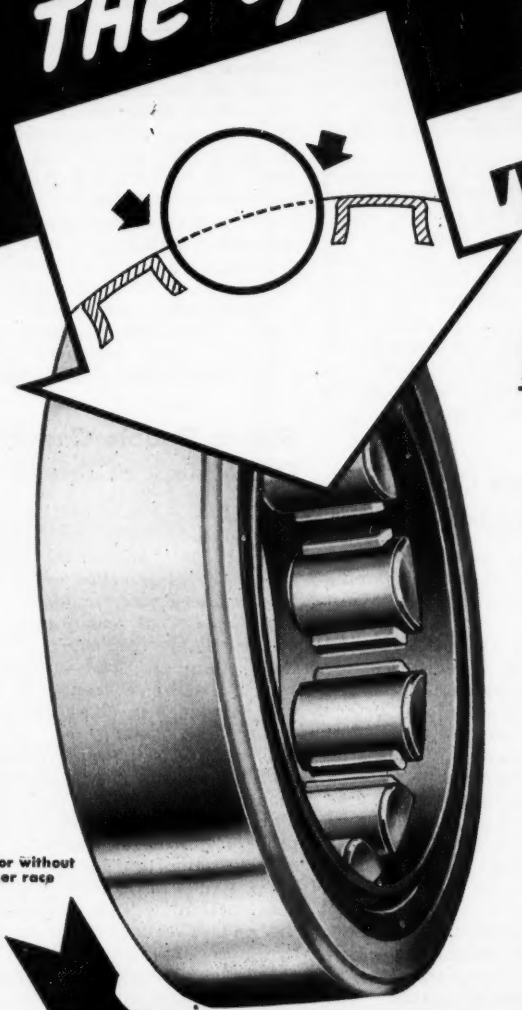

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REFINING

Du Pont Formally Opens New Tulsa Laboratory

The new Tulsa district service laboratory of Du Pont Co. has been formally introduced to the refining industry in "open house" ceremonies at the new center.

The laboratory was first opened a few months ago, following entry of Du Pont on January 1 into the tetraethyl lead marketing field.

The Tulsa laboratory is divided into two sections, one for knock-testing and another for gasoline inspection. It and other Du Pont laboratories do laboratory work for small companies with insufficient facilities and also area available to large companies for checking their own findings.

Socony-Vacuum Opens New Paulsboro Lab

A new chemistry and physics laboratory for improving and developing petroleum products was opened last week by Socony-Vacuum Oil Co., Inc., at Paulsboro, N. J. The new building contains the main laboratories for most of the fundamental research done by Socony-Vacuum, and brings to more than a dozen the number of buildings in the company's research and development department.

With a total laboratory work area of 49,000 sq. ft. the building also contains a library to include more than 7,000 technical books. The laboratory section is about 52 ft. wide and 350 ft. long

The study of radioactive elements as tracers to assist in solving lubrication problems will be carried on at the laboratory. Another activity will be the study of chemical reactions by electronic methods.

Included in the modern and advanced technical equipment is a newly developed electron microscope which magnifies and photographs particles to 100,000 times their original diameters.

Sunray Refinery Sets Record Run of 170 Days

The longest continuous run on record—170 days and 22 hours—for a Dubbs thermal cracking unit, has been established by Sunray Oil Corp.'s refinery at Allen, Okla., it was announced by F. L. Martin, executive vice president of Sunray.

The cracking unit began its run November 10, 1947, and was shut down April 29.

During this record run the unit processed 1,373,675 bbl. of charging stock, an average of 8,037 bbl. daily. The Allen unit, which is the only three-furnace thermal cracking plant in the United States, was erected in 1945 and has a rated daily cracking capacity of 7,000 bbl.

The previous record run by a Dubbs thermal cracking unit was 168 days, according to Universal Oil Products Co., licensors of the process.

The Dubbs cracking unit of Cooperative Refinery Association at Coffeyville, Kans., recently completed a continuous run of 164 days.

Sun to Double Capacity Of Refinery at Toledo

TOLEDO.—Plans for the expenditure of $16,000,000 within the next 2 years to practically double the crude charging capacity of the Toledo refinery was announced here by Sun Oil Co. at the annual reunion of the company's 1,000 employes and their families. The announcement was made by Clarence H. Thayer, vice president in charge of manufacturing.

The expansion will constitute a complete refinery within itself, and includes a 30,000-bbl. per day catalytic cracking unit, the name of the process not being named. Clearing site for the new units will begin June 1, and it is expected that the construction will be completed by the end of 1949, Thayer said. When this work is completed the Toledo refinery will rank in capacity among the 20 largest plants in the country.

The Sun refinery at Toledo at pres-

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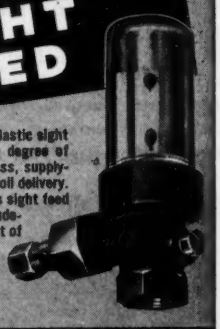
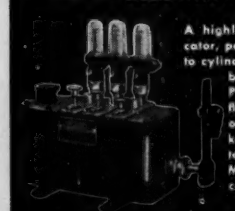
McCORD "CLEARSITE" SIGHT FEED



McCord "Clearsite" plastic sight feeds provide a new degree of visibility and clearness, supplying positive proof of oil delivery. Due to its design this sight feed may be used as an independent sight at point of lubrication. As an accessory it can be added to any lubrication system. Specify "Clearsite."

McCORD "SF" LIQUID SIGHT FEED LUBRICATORS



A highly developed lubricator, particularly adapted to cylinder and bearing lubrication. Features: Precision built, most flexible and positive oil delivery system known. Supplied in 1 to 24 feeds. Specify McCord "SF" Lubricator.

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LUBRICATOR DIVISION

ent has a rated crude capacity of 35,000 bbl. daily and a cracking capacity of 31,000 bbl.

A.S.T.M. Manual on Engine Test Methods Available

A manual designed as a reference work for executives and supervisors as well as operators of test engines and mechanics who inspect and maintain test engines has been released by the American Society for Testing Materials.

The "Manual of Engine Test Methods for Rating Fuels" covers the five engine test methods commonly used throughout the petroleum and automotive industries, in addition to the design of laboratory facilities and equipment, the availability and supply of materials and apparatus, and the operation and maintenance of equipment.

Copies of the book at $8 each, with reduced prices on orders in quantity, may be obtained from A.S.T.M. Headquarters, 1916 Race St., Philadelphia, 3, Pa.

March Output of Lube Oils Shows Increase

Increased production. in all but paraffin oils were reported during March, according to the Western Refiners Association in its report on operations of 13 midwestern refiners.

Production of bright stock for March averaged 10,085 bbl. daily, an increase of 433 bbl. over February. Viscous neutrals averaged 17,401 bbl. daily, a gain of 243 bbl. over the previous month. Steam refined stock and blended oils showed a production figure of 1,092 and 18,312 bbl. daily respectively, an increase of 362 and 298 bbl. daily over production for February.

Paraffin oils for the month of March averaged 3,102 bbl. daily, a drop of 1,129 bbl. daily from the previous month.

Wood River Moves

Wood River Oil & Refining Co., Wichita, has moved its offices from 335 West Lewis Street to 501 KFH Building. The accounting department located at 210 North Market Street is expected to move in with the other departments soon.

Gulf Lets Contract

Gulf Refining Co. has awarded a contract to Turner Construction Co. for construction of a superstructure on a 220 by 240-ft. warehouse at the Philadelphia refinery. The building is scheduled for completion about January 1.

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Among the

Drilling Contractors

A.A.O.D.C. Mud Schools Have Graduated 2,594

Mud schools sponsored by the American Association of Oilwell Drilling Contractors have graduated 2,594 oil-industry men since inception of this educational program, directors of the association announced at a recent quarterly meeting in New Orleans.

The program was 2 years old in April. Currently running are schools at Long Beach, Calif., and Natchez, Miss.

Commenting on the success of the schools, John Woodruff, coordinator of Petroleum Industry Training, University of Texas, reported that the graduates represented results of schools held in nine states. Schools have been held in Texas, Oklahoma, California, Louisiana, Mississippi, Colorado, Illinois, Indiana, and New Mexico.

Woodruff told directors that through use of the association's yearly grants, a $50,000 educational project has resulted. He said that the course textbook, "The Mud Manual," had run through five editions, and that 5,000 had been distributed.

The mud courses are designed primarily to train drilling crewmen in proper use and control of drilling fluids. They are open to both employes of drilling contractors and producing companies. The training is one of several educational projects which the association is sponsoring in an industry-wide attempt to increase efficiency of operation.

Woods Drilling Co., New Orleans, is currently drilling four wildcats for its own account in Harmon, Logan, Pontotoc, and Jefferson counties in Oklahoma and a field well in its discovery, Northwest Iconium field.

Buass Drilling Corp., oil-well drilling contractors of Bakersfield, Calif., reports that the firm has moved its 96-ft. mast and rig to the Rothschild Oil Co. Coreaga lease in Refugio gas field. Drilling was at 1,981 ft. The company is still drilling for Standard Oil Co. of California in the U. S. Naval Reserve, Elk Hills field, on well No. 387-24-Z.

Warren-Bradshaw Drilling Co. holds contract on the Atlantic Refining Co. 1 Shaw, in SE NW NE 7-13n-2e, northeast of Jones field, Lincoln County, Oklahoma. Contractor was moving in rotary tools to start the test.

Gragg Drilling Co. was the contractor on the H. W. Bass and Carter et al 1 Barton, in the Samuel Edmondson Survey of Cayuga field, Anderson County, Texas, which pumped 33 bbl. of 28.6°-gravity oil daily. Total depth is 4,053 ft., with casing set at 4,046 ft.

Crew of Cox Drilling Co., on location at Atlantic Refining Co. 1 Taylor, in Scholem Allechem field, Stephens County, Oklahoma. The men are: J. M. Brumbellow; H. L. Martin; Frank Lindsey; J. T. Jones, driller; Bill Thomas, tool pusher

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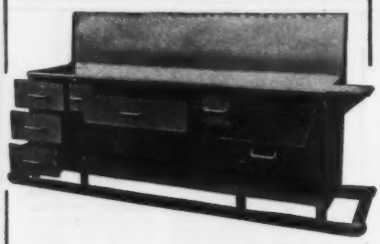

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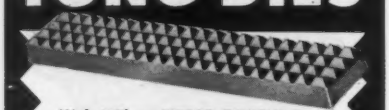

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Hinkle Drilling Co.
Houston

History.—Company was organized in April 1942 by George S. Hinkle. Equipment at the time of its organi-

G. S. HINKLE

C. B. WEBSTER

zation consisted of two small power rigs. Headquarters were originally at 1618 Maury Street, Houston. In October 1946 the company moved to its present office in the Gulf Building. In 1944 P. Bailey entered the firm as a partner, and the company became Hinkle-Bailey Drilling Co. This was dissolved about a year later, and Bailey set up his own contracting business. Present partner of Hinkle in the reorganized Hinkle Drilling Co. is C. B. Webster.

Operations.—Hinkle Drilling Co. at the present time has four rigs, two steam and two power. Both steam rigs and one of the power rigs, which was recently bought, are capable of deep drilling to 15,000 ft. or more. The steam rigs and one power rig are now drilling in North Port Neches field, Orange County; the fourth rig is in South Call field, Newton County.

Personnel.—Besides Hinkle and Webster, personnel includes P. W. McCoy, office manager; Luke Halpain (Orange, Tex.); E. V. Love and G. H. Cloninger (Beaumont, Tex.); all toolpushers; and O. T. Vick (Vidor, Tex.), production superintendent.

Sidelights.—Hinkle for 7 years prior to 1930 was with Burmah Oil Co. at Yenangyaung field in Burma. He was assistant drilling superintendent when he left this company. From 1930 to 1940 he was general superintendent in Houston for American Iron & Machine Works Co., in charge of shops in Houston and in Louisiana. For several years after the first World War, he was a cable-tool contractor in Tulsa. Webster was a driller with Nicklos Drilling Co. prior to joining the Hinkle organization in September 1944. He previously worked for several other contracting companies.

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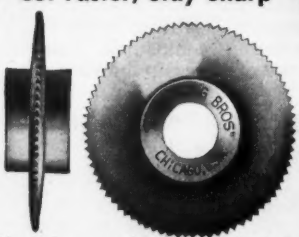

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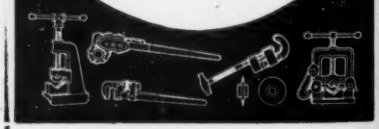

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NATURAL GAS

Conservation Called for In Investigation Report

WASHINGTON. — Adoption by all gas-producing states of strong conservation laws prohibiting the waste of natural gas and requiring the equitable sharing of available market outlets as to all produced gas, including marketable oil - well gas, was recommended last week by Federal Power Commissioners Nelson Lee Smith and Harrington Wimberly in the final volume of their report on the natural-gas investigation.

In recommendations to the industry, the commissioners called for strong support of state conservation programs to eliminate flaring of gas and prevent underground losses of recoverable liquid hydrocarbons, and told the major pipe lines they should absorb greater volumes of oil-well gas now being flared in the Southwest fields.

Proposals Outlined

Their recommendations for congressional action were largely along the lines of the argument made by the two commissioners at hearings on the Rizley - Moore bill: exemption from FPC control of independent producers and gatherers of natural gas and, at the other end of the pipe lines, of local distributing companies; establishment of a standard of reasonable commodity value for gas produced by pipe lines or their affilates, for rate-making purposes; development of a more workable basis for commission determination of service areas; clarification of provisions of the act relating to those engaged or proposing to engage in the export or import of natural gas so that their status may be clear, unnecessary procedures avoided, and the same standards applied to both foreign and domestic commerce involving natural gas; and changes in the law to define more clearly the commission's authority over rate suspensions and undue discriminations in interstate wholesale sales, temporary operations, and emergency interconnections, and hearings.

The report also recommended that, for maximum efficiency of production and the greatest ultimate recovery, the states should enact and enforce statutes requiring, under defined conditions, operation of an entire oil-gas natural reservoir as a unit, and emphasized that the natural-gas industry itself should be "alert and active" in anticipating the potential need for and development of alternative supplies of gas fuel to replace natural gas, as and when available reserves of natural gas decline.

The commissioners noted that the latest report of the American Gas Association and American Petroleum Association estimated the proved natural-gas reserve last January 1 at approximately 166 trillion cubic feet, not including over 3.2 billion bbl. of associated natural-gas liquids, an increase of more than 5 trillion cubic feet in 1947 after allowance for an estimated net production of about 5.6 trillion cubic feet, and foresaw further large additions in the future, but refused to predict how long accretions to reserves may keep ahead or abreast of production and consumption.

Waste Reduction

The report found that the conservation laws of most of the states provide for the prevention of waste and almost no dry gas is now being flared or vented. However, it stated, great quantities of casinghead gas are being blown to the air in many Southwest oil fields and "reduction of such waste to the absolute irreducible minimum is the foremost conservation problem confronting the oil industry and the producing states." This, it admitted, presents some complex problems and there probably will always be a minimum of gas wasted to the air, "but unquestionably there are large volumes now flared which can be recovered and marketed economically, if the necessary efforts are made and if the price of the gas will justify its collection."

Southern Natural to Pay 1½ Cents More for Gas

Southern Natural Gas Co. has contracted to pay 1½ cents per 1,000 cu. ft. more for gas purchased from Gwinville field, Mississippi. Superior Oil Co. of California, which controls 12,050 acres in the field, will supply gas for Southern Natural at a cost of 7½ cents, formerly 6 cents, per 1,000 cu. ft. The contract is subject to approval of the Federal Power Commission.

The new price is to be effective for a 5-year period, at the end of which the price will go to 8 cents per 1,000 cu. ft. A stipulation in the contract provides that the price will not be reduced below 6.4 cents.

The increase was agreed upon April 13, through a series of conferences between C. P. Wrather, president, and H. D. McHenry, of Southern Natural, and Elmer Patman and M. U. Broussard, of Superior, and Alice Crowell, consulting engineer and natural-gas broker of Shreveport, La.

FPC to Reopen Hearing Involving Alabama Projects

The Federal Power Commission will open a public hearing May 12 in Washington, on reopened proceedings involving applications filed by Southern Natural Gas Co. and Alabama-Tennessee Natural Gas Co.

Evidence will be studied which concerns service of new markets in northern Alabama, for which area Southern Natural and Alabama-Tennessee have requested authority to construct and operate new facilities.

Gesner, Niederer Talks to Highlight S.C.M.A. Meeting

"Regulated Control of Gases and Liquids," and "Unitary Gas Regulation," reports to be given by James Gesner, of Reliance Regulator Corp., and Edward Niederer, division engineer of Southern Counties Gas Co., respectively, will highlight the meeting of the Southern California Meter Association at the Rio Hondo Country Club, May 20.

Natural-Gas Operating Revenues Up 12 Per Cent

Operating revenues of natural-gas companies as reported to the Federal Power Commission totaled $88,652,908 for January this year, an increase of 12.1 per cent over the same month a year ago.

For the 12 months ending January 31, 1948, gas operating revenues amounted to $749,724,468, an increase of 15.6 per cent over the preceding 12-month period.

Gas sales to ultimate consumers in January 1948 were 143,521,000,000 cu. ft., an increase of 8.6 per cent over the same period last year. Sales to residential consumers increased 13.8 per cent and to commercial and industrial consumers 17.7 per cent and 3.7 per cent respectively.

Gas utility operating income for January this year amounted to $20,019,749, an increase of 3.9 per cent over January 1947.

Gas operating revenue deductions amounted to $68,648,531, up 14.8 per cent. Of this total, operating expenses accounted for $50,352,889, up 17.6 per cent; depreciation for $6,372,398, up 5.7 per cent; and taxes for $11,923,244, up 8.9 per cent.

Exploration and Drilling

Research and Reserves Get Geologists Attention

WHEN 3,011 people attend a 5-day session of exploration scientists, covering the latest developments in geology, geophysics, paleontology, and mineralogy, it is obviously impossible to report all the outstanding events. Moreover, from past experience, we all know that frequently something that appeared of little significance at the time, in future years turns out to have been the most important thing that happened.

There were two things at Denver, however, that will undoubtedly turn out to be important to the entire petroleum industry for many years to come. One was the news of the action of the American Petroleum Institute on the proposed research program of the American Association of Petroleum Geologists. The second was an important proposal by A. I. Levorsen, in his talk on the occasion of the acceptance of the Sidney Powers Memorial Award, the highest honor bestowed by the A.A.P.G.

It was announced that the research committee of the board of directors of the A.P.I. had approved the recommendation of its "Committee on Fundamental Research Into the Occurrence and Recovery of Petroleum" on the program of fundamental research of the A.A.P.G. *(For full details of this recommendation, see The Oil and Gas Journal, November 22, 1947, page 109.)* While the immediate effect of this action of the A.P.I. board of directors is merely to approve spending $10,000, in effect it also says that the A.P.I. is ready to sponsor a research program in sedimentology of recent and near-recent sediments that may well cost $200,000 per year for several years.

Levorsen's proposal was a frank recognition of the responsibility of the exploration scientists to national and international welfare, and their duty to furnish the American public and government officials with an authoritative assay each year of the undiscovered petroleum probabilities of this country. As he put it—"As the result of each year's drilling, some areas appear to be more favorable for discovery, while others appear to be less favorable."

He proposed that a representative committee of the A.A.P.G. should survey the important changes and announce their results at the annual meetings. This type of survey, parallel with the proven-reserves report of the A.P.I., would be of the utmost value to our national planning, lawmaking, and safety, and would provide the public with an authoritative statement of the current status of our petroleum prospects.

Refering to the A.P.I. data, Levorsen stated: "These known reserves, however, are but a working stock, whereas the extent of the undiscovered reserves is the crux of the entire petroleum reserve picture." *(For more detailed explanation of the meaning of proven reserves as "working stock," see The Oil and Gas Journal, March 2, 1946, page 44.)*

Petroleum geologists and geophysicists, according to Levorsen, now have the grave responsibility of maintaining an adequate supply within the United States of one of the most essential and important of all war materials. "We have suddenly become the keystone in the structure of our whole national safety. There is no retreat from our position. To go forward, however, requires the best brains and thinking in America. May we measure up!"

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SOUTH LOUISIANA.—The Texas Co. is testing its deep test in the Queen Bess Island area, Jefferson Parish, at 16,022-59 ft., in an attempt to open the deepest production in the world. The 4 State-Barataria Bay is at a total depth of 16,106 ft., with 5½-in. casing cemented on bottom.

ROCKY MOUNTAIN.—The first of several Tensleep tests in the Sand Draw area, Wyoming, failed this week, when Sand Draw Oil Co.'s deep test found that formation dry. The well will be plugged back as a commercial gas well in the Morrison. Pure is running gamma-ray log of the deep West Poison Spider wildcat at 14,303 ft., total depth, and may test Frontier(?) saturation at that depth. The fourth Vernal Unit, Uintah County, Utah, wildcat being drilled by Carter found some oil on drill-stem test, and is drilling ahead.

EAST TEXAS.—In western Wood County, a prospective sub-Clarksville discovery has spurred interest in a 1943 failure north of Alba. B. B. Orr 1 Rainwater may be plugged back from 6,537 ft. to 4,075 ft., and other wells reworked, pending outcome of the Rainwater and Bridewell & Jackson 1 McKenzie, currently testing at 4,030-42 ft.

CANADA.—Okalta 2, LSD 10, 33-49-26w4, swabbing into production, indicates an important south extension to Leduc field, or an entirely new field.

WEST TEXAS.—Anderson-Prichard Oil Corp. 1 Foster, Sterling County discovery, was completed for daily flowing potential of 846 bbl. of oil, based on 8-hour flow of 282 bbl. through ¾-in. tubing choke. In Upton County, Wilshire Oil Co. 1 McElroy Ranch recovered clean oil from a third deep zone, from 9,800-9,900 ft., thought to be lower Permian. Other oil-bearing zones were 7,922-8,004 ft. (Wolfcamp), and 9,424-82 ft.

MID-CONTINENT.—In Oklahoma, Kingwood Oil Co. added another producer to the number of wells that may prove a connection of the South and Southeast Ceres pools of Noble County. The company's 6 Bolay, 35-23n-1w, flowed 345 bbl. of oil in 12 hours from the Bartlesville. A well in Section 26 is in the process of completion, and two other locations have been staked in the area. Near Wichita, Kansas, J. P. Gaty 1 Phillips, 8-26s-2e, Sedgwick County, is reported bailing 500 bbl. daily for a possible pool discovery.

MICHIGAN

Drilling Permits Hit Record for Year

SAGINAW.—The seasonal pickup in Michigan oil and gas activities has developed with the State Conservation Department issuing 28 drilling permits in the past week, the largest number of the year. The new operations are scheduled in 11 counties.

Five of the new locations were listed for Bay County, four of them by Gulf Refining Co.: three for wells in Kawkawlin Township, one in Monitor Township. Michigan Gas Storage Co. prepared to start five new facility wells in Summerfield Township, Clare County. Eugene Hillard of Mt. Pleasant announced four locations in Rosecommon Township, Rosecommon County. Other locations included: four in Allegan County, two in Van Buren County, three in Newaygo County, and one each in Kent, Kalkasha, Lake, Clinton and Crawford counties. Permits include an additional one to Mercer Oil Co. of Alma to deepen a well in Belvidere Township, Montcalm County.

The completions for the week numbered 10, included 2 oil wells, a wildcat gas well and 7 dry holes, 5 of which were wildcat failures. Of the producers, Mercer Oil Co. A-1 Jones in Bushnell Township, Montcalm County, was the better, flowing 100 bbl., pinched, after acidizing at 2,674 ft. The other producer, pumping 70 bbl. a day from 2,930 ft., was in Kawkawlin Township, Bay County. The wildcat gasser, rated at 4,520,000 cu. ft. a day, was drilled by Harper & Turner Oil Co. in New Haven Township, Gratiot County.

The State Oil Advisory Board announced that on May 14, at Lansing, it will begin an over-all review of Michigan oil field proration schedules.

MICHIGAN SUCCESSFUL WILDCAT

Gratiot County, New Haven Township: Harper & Turner Oil Co. 1 Rudd-McLaren et al, NW SE NW 25-10n-4w, 4,520,000 cu. ft. gas, TD 987 ft.

MICHIGAN WILDCAT FAILURES

Clinton County, Lebanon Township: T. F. Caldwell 1 Lulu B. Winans et al, NE SW NW 21-8n-4w, dry in Dundee, TD 2,901 ft.

Grand Traverse County, Paradise Township: J. O. Mutch 1 Clair and Vere Taylor, NW NW NW 19-25n-10w, dry in Dundee, TD 2,649 ft.

Montcalm County, Evergreen Township: W. Spencer Cook 1 Rosamond Merritt, SW NE NW 13-10n-6w, dry in Dundee, TD 3,254 ft.

Newaygo County, Denver Township: Sun Oil Co. A-1 State-Denver, NE NE SE 10-14n-14w, dry in Traverse lime, TD 2,171 ft.

Roscommon County, Backus Township: Chapman Oil Co. 1 J. J. Reilly, NE SE NW 33-22n-2w, dry in Dundee, TD 3,903 ft.

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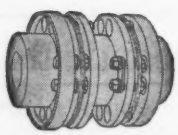
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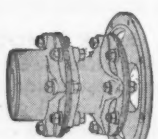
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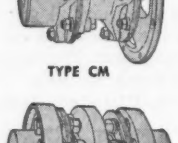
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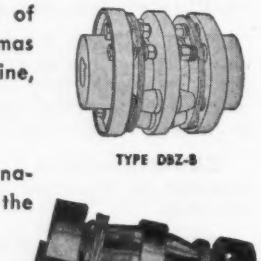
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TEXAS GULF COAST

Brazoria County Gets New Pool

HOUSTON.—A new oil field in Iowa Colony area of Brazoria County has been opened at Jack W. Frazier 1 Lillie O. Hurlock, located in the HT&B Survey, Section 55, 2 miles southeast of the Iowa Colony townsite. On a drill-stem test of open hole from 9,095-9,116 ft., using ¼-in. bottom choke and ½-in. top choke, the well flowed at the rate of 600 to 800 bbl. of 33.6°-gravity oil per day with 600 psi. pressure on the top choke. No water was shown. This is approximately 650 ft. into the Vicksburg formation. Operators are preparing to run electric log and to test the well further.

Fullerton Oil Co. and Ryan Consolidated Petroleum Co. 1 Carrie McDonald, deep test to the Vicksburg zone in the Long Mott area of Calhoun County, 4 miles north of Seadrift, blew gas and water cushion and oil for 15 minutes after 7 stands had been pulled on drill-stem test at 9,645-61 ft. Bottom-hole pressure was 4,275 psi. open, and 5,225 psi. shut in. Total depth is 9,922 ft., and operators may drill deeper.

McDannald Oil Co. completed a new gasser in the Hutchins field of Wharton County. The 1 J. A. Crenshaw in H&TC Survey, Section 9, Abstract 186, flowed 2,476,000 cu. ft. of gas per day through a ¼-in. choke with 1,250 psi. pressure on tubing and 1,275 psi. pressure on the casing. Open flow calculation is 30,000,000 cu. ft. per day with production through perforations at 3,198-3,210 ft.

A new oil sand for East Beech Creek field in Hardin County, has been opened at American Republics Corp. 2 H. & T. C. fee, in H&TC Survey, Section 119. Total depth is 7,449 ft., with top of sand at 6,710 ft., and perforations at 6,711-13 ft. Initial production flowed 154 bbl. of oil per day through a ⅛-in. choke, gas-oil ratio 649, gravity 38.5°.

There were 36 new locations reported for Districts 2 and 3, 10 of which are wildcat starts, 4 in Victoria County, and 1 each in Bee, Brazoria, Galveston, Liberty, Wharton and Wilson counties. One successful exploratory test opened new oil sand in East Beech Creek field, Hardin County, while 9 wildcats were failures, 2 in Bee County, and 1 each in Jackson, Jefferson, Karnes, Matagorda, San Jacinto, Victoria, and Wharton counties.

TEXAS GULF COAST (DISTRICTS 2 & 3) SUCCESSFUL WILDCAT

Hardin County: New oil sand, East Beech Creek field—American Republics Corp. 2 H & T C fee, in H&TC Sec. 119, TD 7,449 ft., top sand 6,710 ft., perf. 6,711-13 ft., IP: 154 bbl. oil per day through a ⅛-in. choke, GOR 649, TP 975 psi., gravity 38.5°, 0.4 per cent water.

TEXAS GULF COAST (DISTRICTS 2 & 3) WILDCAT FAILURES

Bee County: Stanolind Oil & Gas Co. 1 Florence McCollom, in A. Jackson Davis Sur., 2 mi. SW of Yoward field and 4 mi. SW of Mineral, dry, TD 9,074 ft.

Union Producing Co. 74 G. A. Ray, in R. G. Millican Sur., 4 mi. E of Pettus townsite, dry, TD 5,004 ft.

Jackson County: Hunt Oil Co. 1 E. T. Rose et al, in J. L. Faulkner Tr. in Carlos Lasso Sur., dry, TD 6,814 ft.

Jefferson County: Hunt Oil Co. 1 Dishman & Lucas, in Wm. McFarland Lge., A-39, 4 mi. SE of Nome townsite, dry, TD 9,890 ft.

Karnes County: L. M. Fischer & Tom Graham 1 L. Krawitz, in A. Hernandez Grant, 5 mi. NE of Falls City, dry, TD 6,229 ft.

Matagorda County: The Texas Co. 1 Mrs. Jennie Phillips, in H. L. Cook Lge., on Matagorda Peninsula, 10 mi. S of gas production at Collegeport, dry, TD 6,456 ft.

San Jacinto County: Phil Harris & Alice Faye 1 Sue Hill et al, in Vital Flores Sur., 5 mi. S of Evergreen townsite, dry, TD 4,474 ft.

Victoria County: Ginther, Warren & Ginther 1 Mrs. Mary A. Simmons, in Placedo Benavides Grant, A-124, 5 mi. E of Placedo, dry, TD 6,261 ft.

Wharton County: Cities Service Oil Co. 2 Edwin Hawes Jr., in S. Castleman Lge., in North Withers area, dry, TD 6,910 ft.

MISSISSIPPI

Successful Field Wells Highlight Week's Work

JACKSON.—Gulf Refining Co. 1 George F. Taylor, 27-1n-12e, in West Heidelberg field, Jasper County, has been completed for an initial production of 147 bbl., pumping, per day, gravity 22.8°. Perforations for completion were made at 5,082-89 ft., and 5,093-97 ft. Total depth is 5,122 ft.

W. J. O'Brien 1 Fannie Green, 8-6n-2w, in La Grange field, Adams County, drilled to a total depth of 6,270 ft., and was completed for final gage of 132 bbl. of 38.5°-gravity oil flowing through a 10/64-in. choke, tubing pressure 300 psi., casing pressure 325 psi. Production is through perforations at 6,225-31 ft. from the Baker oil sand.

Also in La Grange field, Adams County, Sohio Petroleum Co. completed its E-2 Parker, Lot 139, Section 9-6n-2w, pumping 128 bbl. of 38°-gravity oil per day. Total depth is 6,281 ft., with perforations at 6,189-92 ft.

In Mallalieu field, Lincoln County, California-Humble-Danciger 1 W. I. Bowman et al Unit 1, 21-6n-8e, was completed flowing 438 bbl. of 37.9°-gravity oil flowing through perforations at 10,410-29 ft., and 10,448-55 ft. Total depth is 10,487 ft. with top of oil sand at 10,406 ft.

Humble Oil & Refining Co. B-6 G. M. & O. R. R. Co., 24-9n-8w, in Yellow Creek field, Wayne County, pumped 232 bbl. of 20.2°-gravity oil in 24 hours. Total depth is 5,102 ft. Perforations for completion were made at 4,938-48 ft., 5,009-20 ft., and 5,046-57 ft.

The eight new locations included four wildcat starts, one each in Adams, Franklin, Greene, and Scott counties. The four development locations were in Cranfield field, three in Adams County and one in Franklin County.

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CASE

Giant Rig for DEEPEST MARINE DRILLING

by ELTON STERRETT
Engineering Editor

DESIGNED and engineered to meet the problems of 18,000-foot drilling, Shell Oil Company, Inc.'s new barge unit, known so far only as Marine Rig. No. 7, was coordinated with others to produce a completed rig which would handle all anticipated loadings and would at the same time be capable of resisting hurri- and 54 feet wide. The hull is 14 feet, of which about nine feet is designed to be submerged when the barge is in place and resting on bottom. Floating draft, for shifting through a

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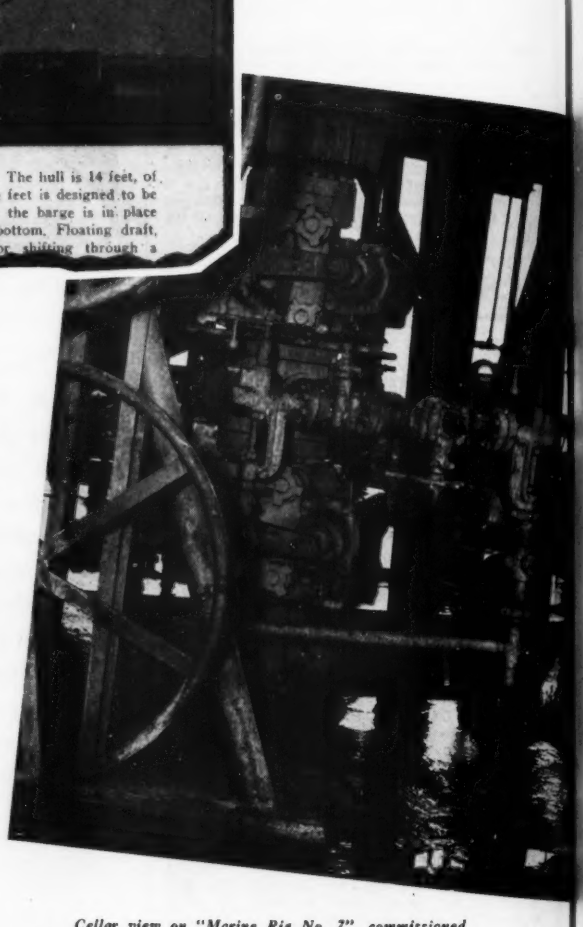

Cellar view on "Marine Rig No. 7", commissioned recently for deep marine drilling, showing the drilling control assembly which includes 3 Cameron 10" Type "QRC", Series 1500 API, Pressure-Operated Blowout Preventers.

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MISSISSIPPI WILDCAT FAILURE

Rankin County: Cities Service 1 A. Harper, 21-3n-3e, dry, TD 9,152 ft., electric log tops: Christmas sand 7,830 ft., Tuscaloosa 7,860 ft., Marine Tuscaloosa 8,634 ft., base Marine Tuscaloosa 8,757 ft., Massive sand 8,900 ft., Lower Cretaceous 9,070 ft.

SOUTH LOUISIANA

New Gas-Condensate Sand Found in Four Isle Dome

NEW ORLEANS.—Superior Oil Co. of California has opened a new gas and condensate producing sand on the southeast flank of the Four Isle dome in Terrebonne Parish. The 3 L. L. E.-State Unit 12, was drilled to a total depth of 11,504 ft., and flowed at the rate of 62 bbl. of 46.7°-gravity condensate per day along with 5,832,000 cu. ft. of gas through a ¼-in. choke. Flowing pressure on tubing was 3,950 psi. Plugged back total depth is 10,780 ft., and perforations for completion were made at 10,749-764. ft.

A new producing level for Iota field, Acadia Parish, has been opened by Sohio Petroleum Co. 1 D. A. Burnell, located ¼ mile southeast of Crown Central 1 Duson well in Section 14-8s-2w. Total depth is 8,754 ft., with 5½-in. casing cemented at 5,751 ft. and perforations from 8,666-98 ft. for completion. On a final gage, the well flowed 291 bbl. of 32.2°-gravity oil per day through a 10/64-in. choke with 1,100 psi. flowing pressure on the tubing and a gas ratio of 565.

Magnolia Petroleum Co. 1 Doornbos-McPherson, in Hurricane Creek field, Beauregard Parish, Section 26-5s-8w, is being completed in a shallow sand. It drilled to a total depth of 9,100 ft., with 9,000 ft. of 5½-in. casing in the hole. Deeper tests failed to show favorably and hole was plugged back and pipe perforated from 8,234-42 ft.; on drill-stem test the well flowed 40 bbl. of 48.3°-gravity oil in 8 hours through a 7/64-in. choke. This is the third well for Magnolia and is located ¼ mile south of the 1 Four C. McPherson discovery well in the 8,400-ft. level. Location for the 2 Doornbos-McPherson is spotted in Section 26-5s-8w.

In Queen Bess Island area, Jefferson Parish, Texas Co. 4 State-Barataria Bay, which is seeking to open the deepest production in the world, failed on initial test at 16.022-059 ft. and is retesting.

Humble Oil & Refining Co. 1 Lewis LeBlanc, 2,500-ft. southeast extension test to Hester dome production, St. James Parish, has been completed for a final gage of 130 bbl. of 53.3°-gravity condensate daily through a ¼-in. choke with a gas ratio of 3,609. Total depth is 10,150 ft., and production is through perforations at 9,795-9,802 ft.

A new deep sand for the Horseshoe Bayou field of St. Mary Parish has been opened by Texas Co. 6 State-St. Mary Parish Land Co. Unit 1, 40-17s-19e. Total depth is 12,102 ft., with 7-in. casing set on bottom. On a 24-hour test, the well gaged 443 bbl. of 35.1°-gravity oil per day through a 10/64-in. choke with 1,950 psi. flowing pressure on the tubing, through perforations at 11,994-12,004 ft.

The Texas Co. 30, State-West Cote Blanche Bay field in St. Mary Parish. Total depth is 10,008 ft., with 7-in. pipe to bottom, perforated at 6,553-64 ft. and completed for 225 bbl. of 31.7°-gravity oil per day through a 9/64-in. choke.

The 15 new locations reported this week included 3 wildcat starts, 1 each in Cameron, St. Mary and Terrebonne parishes. Four exploratory tests were successful, two in St. Mary Parish and one each in Calcasieu and Jefferson parishes. There were three dry wildcats, one each in Allen, Lafayette and Orleans parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Calcasieu Parish: New gas-condensate discovery, Bell City area—Sohio Pet. & General Crude Oil Co. 1-B Sweet Lake Land & Oil Co., 30-10s-6w, 1¾ mi. E of Holmwood field production, TD 10,843 ft., top sand 10,736 ft., perf. 10,736-750 ft., IP: 31 bbl. condensate per day and 2,115,000 cu. ft. gas per day through 10/64-in. choke, GOR 68,286, TP 3,700 psi., gravity 48°, no water.

Jefferson Parish: New oil sand, Bay De Chene—The Texas Co. 5 State-Bay De Chene Lease 356, in Bay De Chene, Twp. 19s-24e, TD 9,556 ft., perf. 6,862-78. ft., IP: 168 bbl. oil per day through 9/64-in. choke, GOR 1,006, TP 1,100 psi., gravity 33.3°, 0.1 per cent water.

St. Mary Parish: New oil sand, Horseshoe Bayou—The Texas Co. 6 State-St. Mary Parish Land Co. Unit 1, 40-17s-9e, TD 12,102 ft., oil sand 11,950-12,014 ft., perf. 11,994-12,004 ft., IP: 443 bbl. oil per day through 10/64-in. choke, GOR 746, TP 1,950 psi., gravity 35.1°, 0.2 per cent water.

New oil sand, West Cote Blanche Bay—Texas Co. 30 State-West Cote Blanche Bay, Lease 340, Twp. 16s-7e, TD 10,008 ft., oil sand 6,553-80 ft., perf. 6,553-64 ft., IP: 225 bbl. oil per day through 9/64-in. choke, GOR 397, TP 910 psi., gravity 31.7°, 0.1 per cent water.

SOUTH LOUISIANA WILDCAT FAILURES

Allen Parish: Callery & Hurt 1 Industrial Lbr. Co., C NW SE 25-6s-7w, 2 mi. SE of Reeves townsite, dry, TD 8,050 ft.

Lafayette Parish: Gulf Refg. Co. 1 Cleobule Hernandez et al, 18-10s-4e, dry, TD 12,950 ft.

Orleans Parish: Humble O. & R. Co. 1 Gentilly Route Sixty-One, Inc., 42-12s-13e, just east of Lee townsite, dry, TD 9,818 ft.

Republic National Bank *of* Dallas

Statement of Condition, April 12, 1948

RESOURCES

Cash and Due from Banks		$ 93,363,819.02
U. S. Government Securities		36,045,562.54
State, Municipal and Other Securities		2,566,177.54
Stock in Federal Reserve Bank		750,000.00
Loans and Discounts		126,751,798.82
Bills of Exchange and Commodity Loans		17,033,824.26
Bank Premises and Equipment		2,777,257.82
Customers' Liability—Acceptances and Letters of Credit		2,116,084.81
TOTAL		$281,404,524.81

LIABILITIES

Capital	$ 12,000,000.00	
Surplus	13,000,000.00	$ 25,000,000.00
Undivided Profits		1,622,014.07
Reserve for Contingencies		1,799,978.58
Reserve for Taxes, Etc.		839,133.94
Acceptances and Letters of Credit		2,116,084.81
DEPOSITS:		
Individual	$175,249,261.89	
Banks	72,222,207.63	
U. S. Government	2,555,843.89	250,027,313.41
TOTAL		$281,404,524.81

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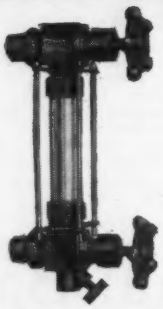

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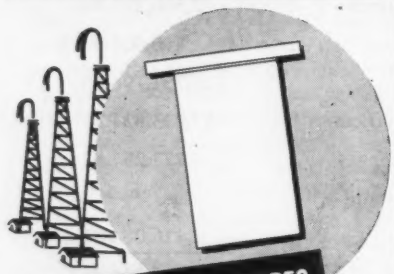

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N. CENTRAL TEXAS

Chico Field Gets Third Producer

WICHITA FALLS.—Wise County's Chico (Bend conglomerate) field gained its third producer this week when Cities Service Oil Co. 1 Berry, E. H. & W. Thompson Survey, made Railroad Commission potential of 160 bbl. of oil in 8 hours, flowing through ¾-in. choke. Previously, the well had made a poor showing in tests of a lower conglomerate between 5,276-5,300 ft. Operators plugged back to 5,271 ft. and perforated with 108 shots between 5,240-58 ft. After first acid treatment of 1,000 gal., it swabbed about 3 bbl. of oil an hour. Swab was run after a second treatment of 2,000 gal., when it kicked off and flowed steadily until storage was filled.

Four miles northwest of Chico, Burk Royalty Co. 1 J. Maguire, H. H. Bradford Survey, A-135, was a failure at 5,816 ft. in shale.

In Throckmorton County, Saguaro Drilling Co. 1-B Saguaro-Herron, Block 1,607, TE&L Survey, 2 miles southwest of the Record (Mississippi) field, and east offset to the Saguaro (Mississippi) field discovery, had not yet reached the Mississippi pay but indicated two additional pays, in the Strawn and Caddo. Both of these zones were dry in field discovery. The 1-B Saguaro-Herron, running high to discovery well, topped Caddo limestone at 4,170 ft. and drilled to 4,190 ft., where a 1-hour drill-stem test recovered 120 ft. of oil and 90 ft. of oil-cut mud. Shut in bottom-hole pressure rose to 1,875 psi. in 15 minutes. Operators were to drill to around 4,800 ft. before making further tests. This well had an even better showing in sand logged from 3,822-38 ft., identified as the Strawn. A 1-hour drill-stem test of that interval recovered 520 ft. of oil and 110 ft. of heavily oil-cut drilling mud.

In northeast Cooke County, R. W. Fair and Paul B. Scott 2 Paul Rivoire, T. G. Murphy Survey, 3 miles west of Gainesville, set casing at 1,920 ft., and completed as a small sand discovery. On completion tests it pumped 32 bbl. of 40°-gravity oil a day, plus about 8 bbl. of water, from the sand zone from 1,920-32 ft. The same operators' 1 Rivoire, first to indicate the sand production, was preparing to test. It had the pay from 1,929-42 ft.

A small Marble Falls limestone discovery was completed 2 miles south of Throckmorton, in Throckmorton County, at Deep Rock Oil Corp. et al 1 Ella Andrews, Section 284, BBB&C Survey. It had the Marble Falls at 4,767 ft., drilled to 4,860 ft. and plugged back to 4,791 ft., where it pumped 28 bbl. of oil a day. Gas-oil ratio was 200 cu. ft. Location is about 2 miles southwest of the Marrs field discovery, which completed for 66 bbl. of oil a day in the Marble Falls section.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) SUCCESSFUL WILDCATS

Shackelford County: Kadane-Griffith Oil Co. 1 J. N. Davis, Sec. 1,546, TE&L Sur., 11 mi. E Albany, flowed 136 bbl. 44°-gravity oil in 6 hours, tubing pressure 800-180 psi., GOR 375 cu. ft., Caddo 4,435-50 ft., TD.

E. H. R. Sabens 19 W. H. Green, Sec. 62, Blk. 12, T&P Sur., 15 mi. SW Albany, pumped 10 bbl. oil a day, sand 1,155-1,210 ft., TD.

Wichita County: Roy H. King 1 Mrs. Frances Morgan, Blk. 1, Margaret Ramsey Sur., 4 mi. N Holliday, flowed 145 bbl. 43°-gravity oil a day, 8/64-in. choke, pay sand 3,880-3,911 ft., TD 3,912 ft., casing pressure 340 psi., tubing pressure 80 psi., GOR 400 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 7-B & 9) WILDCAT FAILURES

Archer County: S. F. Hutcheson 1 O. E. Conklin, A. Balle Sur., A-25, 8 mi. SW Archer City, dry, TD 1,404 ft.

Brown County: Nathan Beckman 1 T. C. Giddings, J. W. Clelland Sur., 1½ mi. E Thrifty, dry, TD 1,705 ft., Caddo 1,553 ft.

Coleman County: Hughes Drilling Co. 1 Sallie Starr McGee, Blk. 35, Burnet CSL 703 2 mi. NW Valera, dry, TD 3,305 ft., Caddo 3,295 ft.

Haskell County: J. C. Hunter, Jr., 1-A Mabel Jean Wood, L. Dyches Sur. 46, 10 mi. NE Stamford, dry, TD 3,382 ft., Palo Pinto 3,287 ft.

Jones County: Humble Oil & Refining Co. 1 Hoke Probst, Sec. 25, Blk. 2, SPRR Sur., 5 mi. SW Anson, dry, TD 3,321 ft., Dotham 2,125 ft., Noodle Creek 2,247 ft., Saddle Creek 2,456 ft., Flippen 2,540 ft., King sand 2,956-68 ft., Swastika 3,023 ft., Reef 3,037 ft., elev. 1,788 ft.

Sherman Hunt, Jr., 1 L. O. Huddleston, Sec. 19, Blk. 17, T&P Sur., 6 mi. SW Hawley, dry, TD 2,757 ft., Dotham 1,980 ft., Flippen 2,371 ft., Hope 2,520 ft., Gunsight 2,708 ft.

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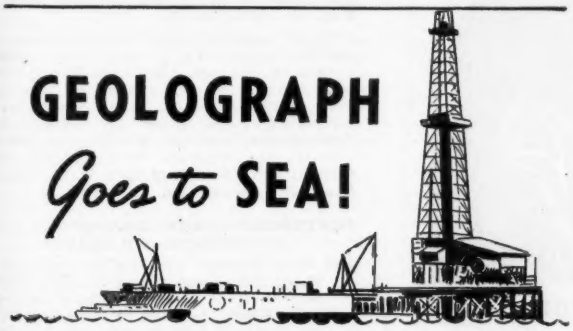

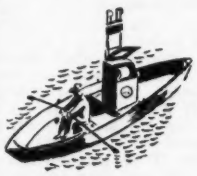

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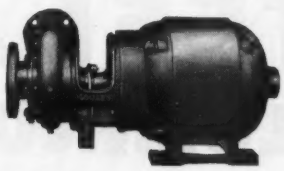

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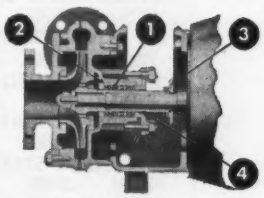

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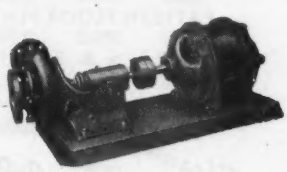

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Montague County: Sun Oil Co. 1 Roxye Howard, Blk. 90, Kaufman CSL Sur., 6 mi. N Bonita, dry, TD 3,959 ft., DST 3,954-59 ft. recovered 80 ft. oil-cut mud, 600 ft. salt water.

Shackelford County: F. M. Robertson and Rhodes Drilling Co. 1-A Morris Cottle, Sec. 57, BOH Sur., 2½ mi. E Moran, dry, TD 3,485 ft., Caddo 3,443 ft.

Wichita River Oil Co. 1-A Walker Buckler Sheldon Trust, M. C. Cooper Sur., NE corner of County, dry, TD 4,903 ft., Palo Pinto 2,135 ft., Caddo 3,965 ft., Marble Falls 4,391 ft., Mississippi 4,567 ft., Ellenburger 4,773 ft., elev. 1,238 ft.

Stephens County: Andrews & Associated 1 E. F. Corbett, Sec. 1,099, TE&L Sur., 5 mi. N Ivan, dry, TD 4,100 ft., Caddo 3,350 ft., Marble Falls 4,093 ft.

Throckmorton County: Sutton & Brazelton 1 Sallie Hanell, D. McKeichan Sur., 15 mi. S Throckmorton, dry, TD 958 ft.

Wichita County: T. A. Norwood et al 1 L. R. Goetze, Sec. 2, GC&SF Sur., 7 mi. NE Electra, dry, TD 2,006 ft.

Wise County: Burk Roy Co. et al 1 J. R. Maguire, H. H. Bradford Sur., 3½ mi. NW Chico, dry, TD 5,816 ft., Hapgood 4,521 ft., sand with stain and odor 4,680-88 ft., Caddo 5,280 ft., elev. 942 ft.

SOUTHWEST TEXAS

New Production Found In Northern Duval County

CORPUS CHRISTI.—New oil production has been opened south of the Seven Sisters field of Duval County, at R. F. Schoolfield et al 1 Welder, wildcat test, in Survey 213. This test is swabbing pipeline oil at the rate of 25 bbl. per day. Operators are rigging up to pump. Total depth is 2,682 ft., with 7-in. casing set to 2,660 ft., for open-hole completion from 2,660-82 ft. Top of the pay sand is at 2,663 ft.

Cam Corporation 2 Olson, wildcat 5 miles northwest of Hebbronville and approximately 4½ miles south-southeast of Cam field, in southwest corner of Duval County, made a little oil on production test through perforations at 3,044-57 ft., but the sand formation is tight; operators are preparing to perforate additional shots. Total depth is 3,125 ft., with 5½-in. casing set to 3,080 ft. This well is located in the El Mesquite Grant.

Comanche Corp. 1 C. M. Scarborough, the company's second producer in its new oil sector at Robstown field, Nueces County, has run potential gage of 73 bbl. per day through a ⅛-in. choke, with 510 psi. tubing pressure, 1,075 psi. casing pressure, and gas-oil ratio of 395. Total depth is 5,061 ft., with 5½-in. casing set to 5,061 ft. and perforated from 5,040-48 ft. for completion.

New oil sand for the Premont pool, Jim Wells County, has been opened at Barnsdall Oil Co. 1 T. T. San Miguel, in Section 80, R. P. Haldeman Subdivision of Seeligson Ranch, SK&K Survey, 11 miles northwest of Premont. Top of pay at 3,430 ft., with perforations at 3,430-40 ft., the well flowed an initial production of 55 bbl. of oil per day, gas-oil ratio 350. Total depth is 5,200 ft.

A new gas pay, also in Premont pool, Jim Wells County, Barnsdall 1 Thirkell, Section 77, R. P. Haldeman Subd. of Seeligson Ranch, topped new pay at 4,421 ft., and flowed 4,500,000 cu. ft. of gas per day on open flow through perforations at 4,421-42 ft. Total depth is 6,113 ft.

In Nueces Bay, Phillips Petroleum Co. 1 Nueces Bay-State, in State Tract 706, almost a mile northwest of gas production in Nueces Bay area, 2 miles northwest of Corpus Christi, opened a new gas pay at 3,284 ft. Initial production on open flow was 10,050,000 cu. ft. gas, through perforations at 3,290-3,300 ft.

There were 37 new locations reported for Districts 1 and 4, 7 being wildcat starts, 1 each in Aransas, Cameron, Duval, Kenedy, Kinney, Nueces and Webb counties. Four successful exploratory tests were completed to open three new sands in Jim Wells County and one new pay in Nueces County. Six wildcats were failures, one each in Frio, Jim Hogg, Jim Wells, Milam, Starr and Uvalde counties.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) SUCCESSFUL WILDCATS

Jim Wells County: New gas pay, Blucher—W. A. Richardson et al 1 Augusta Franz, Sec. 30, R. P. Haldeman Subd. of Seeligson Ranch, ¾ mi. S of Premont townsite, top pay 7,640 ft., TD 7,766 ft., perf. 7,663-70 ft., IP: 30,000,000 cu. ft. gas per day on open flow, shut-in pressure 4,625 psi., no water.

New oil sand, Premont pool—Barnsdall Oil Co. 1 T. T. San Miguel, in Sec. 80, R. P. Haldeman Subd. of Seeligson Ranch, SK&K Sur., A-458, 11 mi. NW of Premont, top pay 3,430 ft., TD 5,200 ft., perf. 3,430-40 ft., IP: 55 bbl. oil per day, GOR 350, TP 38 psi., CP 540 psi., gravity 23°, 0.04 per cent water.

New gas sand, Premont—Barnsdall Oil Co. 1 Thirkell, in Sec. 77, R. P. Haldeman Subd. of Seeligson Ranch, in SK&K Sur., top pay 4,421 ft., TD 6,113 ft., perf. 4,421-42 ft., IP: 4,500,000 cu. ft. gas per day on open flow, shut-in pressure 1,771 psi., no water.

Nueces County: New gas pay and extension, Nueces Bay—Phillips Pet. Co. 1 Nueces Bay-State, in State Tr. 706 in Nueces Bay, almost 1 mi. NW of gas production (now plugged) in Nueces Bay area, 2 mi. NW of Corpus Christi, top pay 3,284 ft., TD 10,935 ft., perf. 3,290-3,300 ft., IP: 10,050,000 cu. ft. dry gas per day on open flow, shut-in pressure 1,560 psi., no water.

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SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Frio County: Kirkwood & Morgan, Inc., 1 R. H. & H. E. Gill, 5 mi. NW of Dilley, in LIM&C Sur. 9, dry, TD 5,500 ft.

Jim Hogg County: Bridwell Oil Co. 1 A. A. Martinez, in Diego Hinojosa Grant, A-357, 3 mi. NE of Hebbronville, dry, TD 4,731 ft.

Republic Natural Gas Co., H. R. Smith, H. J. Mosser & American Republics Co. 1 R. V. Embleton, Blk. 10, Scholars Land Co. Subd. of R. Adams Ranch, 6 mi. N-NE of Alice, dry, TD 5,504 ft.

Milam County: Irving Greenspan et al 1 S. H. Yoakum, T. J. Chambers Sur., 3 mi. NE of Rockdale, dry, TD 4,201 ft.

Starr County: K. D. Owen et al 1 H. P. Guerra, Sur. 296, 25 mi. NW of Rio Grande City and 5 mi. SE of Guerra field, dry, TD 5,002 ft.

Uvalde County: Production Service Co. 1 G. A. Kennedy, in J. J. Guerra Sur. 75, 4 mi. NE of Uvalde, top Glen Rose 2,232 ft., Trinity 2,836 ft., dry, TD 2,865 ft.

EASTERN TEXAS

San Augustine Outpost To Drill Below 7,641 Ft.

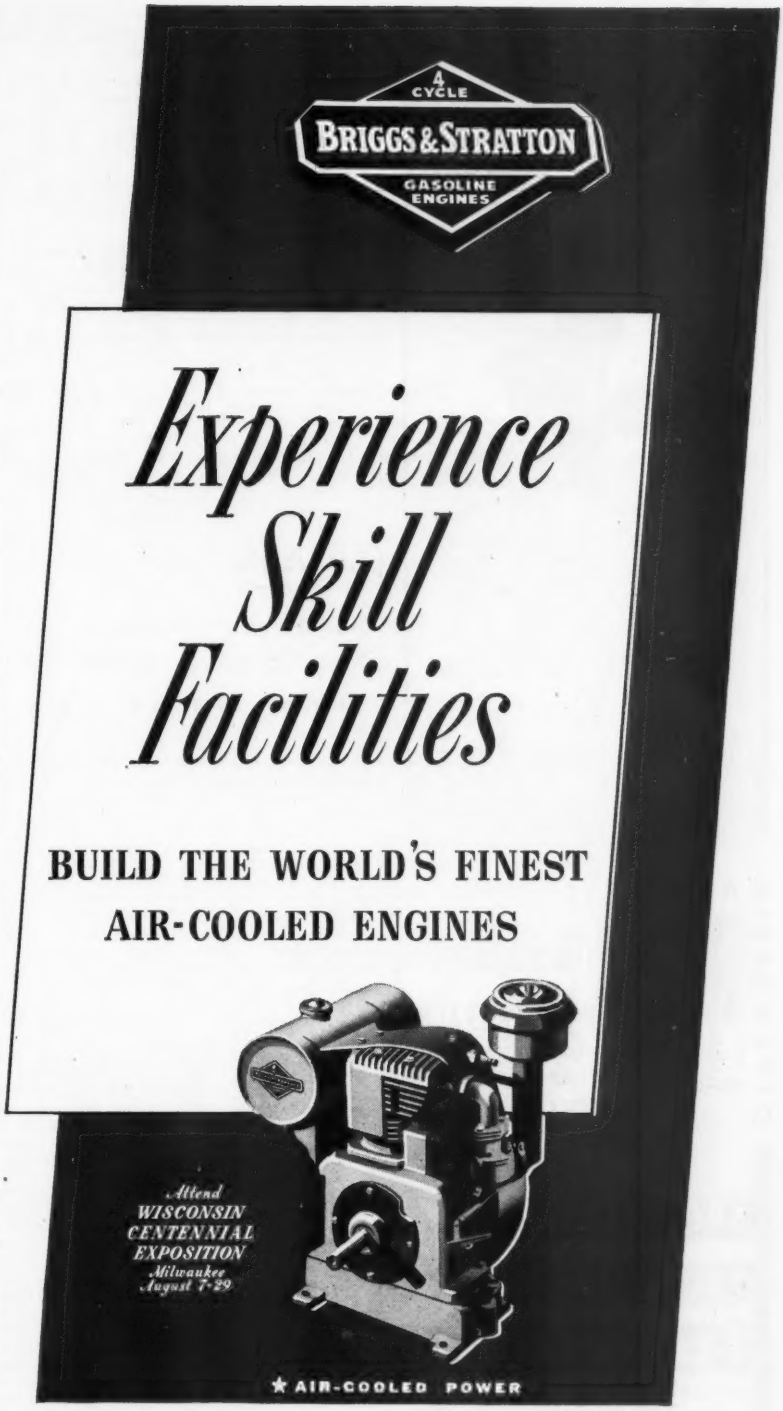
DALLAS.—Hiawatha Oil & Gas Co. 1 Will E. Johnson, southwest outpost test to the San Augustine field, had total depth at 7,641 ft. and was preparing to drill ahead. Cores at 7,455-94 ft. recovered 20 ft. of broken lime with fair odor, fluorescence and cut, 10 ft. of black limy shale with gas odor on fresh break, and 20 ft. of gray to brown lime with fair odor. Cores at 7,594-7,602 ft. had 3 ft. of lime with slight show of oil and gas, and 4 ft. of broken lime with no shows. A drill-stem test between 7,606-41 ft. failed after 2 minutes, recovering 300 ft. of slightly gas-cut mud.

In Freestone County, Humble Oil & Refining Co. 1 R. P. McWatters continued drilling below 12,563 ft. in shale, and in Henderson County, W. B. Hinton 1 J. M. Criswell estate, C. M. Walters Survey, was drilling in lime and shale at 6,350 ft. Sample top on the Kiamichi shale was placed at 6,110-40 ft.

T. D. Humphries 1 E. B. Tuggle, Kaufman County test 4 miles east of Kemp, had total depth at 5,110 ft., by electric log, and was shut down for orders. On elevation of 368 ft., it had top of the Paluxy sand at 4,841 ft. Earlier it had cored fair stains and odor between 4,845-54 ft., but a drill-stem test from 4,842-54 ft., open 40 minutes, recovered 30 ft. of mud, 180 ft. of muddy salt water, and 1,180 ft. of salt water. Bottom-hole flowing pressure was 695 psi.

Near the western boundary line of Wood County, 1 mile northeast of Alba, Bridewell & Jackson 1 McKenzie was erecting tanks for further tests after recovering 350 ft. of heavily oil-cut mud on a drill-stem test of the sub-Clarksville at 4,030-42 ft. Operators said the fluid was about 50 per cent oil. The sub-Clarksville was entered at 4,028 ft., on an elevation of 437 ft. Electrical survey was run and it was estimated to have some 12 ft. of pay section between 4,028-55 ft. Total depth is 4,123 ft.

In Panola County, 4 miles north of the Carthage gas area, G. J. Hollandsworth 1 Alice Craine, Sweeten Survey, had promises of becoming a gas or distillate producer and extension to the field. A drill-stem test from 6,380-6,415 ft., open 30 minutes, recovered 15 ft. of salty mud and 540 ft. of muddy salt water. It was assumed this test was in the Travis Peak. At 6,530-75 ft., in lower Pettit porosity, the recovery was 30 ft. of straw-colored distillate, in 11 minutes. A 12-minute test at 6,533-75 ft. recovered 40 ft. of mud cut



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with distillate. Total depth is 6,665 ft. in sand. An earlier report indicated it would be carried to around 7,000 ft.

EAST TEXAS (DISTRICTS 5 & 6) SUCCESSFUL WILDCAT

Smith County: Magnolia Pet. Co. and Sinclair Prairie 1 R. W. Fair, Wm. Schofield Sur., 3 mi. SW Lindale, completed as gas-distillate well, flowed 850,000 cu. ft. gas and approximately 75 bbl. 59°-gravity distillate, Rodessa porosity 9,512-81 ft., TD 10,493 ft.

EAST TEXAS (DISTRICTS 5 & 6) WILDCAT FAILURES

Red River County: Garland Anthony 1 W. B. Megason, Wm. Collum Sur., 1½ mi. E Avery, dry, TD 4,358 ft., Woodbine 2,170-2,220 ft., Georgetown 2,296 ft., Massive anhydrite 3,642 ft., no shows, elev. 477 ft.

Smith County: W. F. Nenney 1 Ione Braziel, Thomas Rives Sur., A-802, 4 mi. E Lindale, dry, TD 7,014 ft., Navarro chalk 2,115 ft., Nacatoch 2,175 ft., Pecan 2,745 ft., sample tops: Woodbine 5,055 ft., Comanche 5,934 ft., Georgetown 5,964 ft., elev. 343 ft.

LA.-ARK.

Bull Bayou Operation May Complete as Gas Well

SHREVEPORT.—On the south flank of the Bull Bayou field in DeSoto Parish, The Texas Co. 1 F. J. Rambin, SE NW 23-11n-11w, found the Travis Peak dry, but had prospects of becoming a gas well. The Travis Peak was logged at 6,664 ft. and drilled to 8,082 ft. First plug back was 5,130 ft., where the well flowed 1,000,000 cu. ft. of gas a day plus 100 bbl. of salt water, from perforations at 5,094-5,120 ft. The second plug back, to 5,035 ft., apparently shut off the water, and after treating with 3,000 gal. of acid, gas flow had increased to around 1,500,000 cu. ft. a day through ¾-in tubing choke. Tubing pressure was 175 psi., flowing, and 615 psi. shut in. No distillate was reported with the gas.

In Lincoln Parish, The Carter Oil Co. 1 Martin Matthews, 22-18n-4w, continued drilling, after coring and testing. Hard, tight sand, bearing a slight distillate odor and fluorescence was cored from 9,706-16 ft. A 1-hour drill-stem test of that interval produced a slight blow for 20 minutes, and recovered the water cushion plus 75 ft. of distillate and gas-cut mud. Cores from 9,794-9,807 ft. recovered sand with gas odor. A drill-stem test failed and operators cored more sand with gas odor to 9,846 ft. The last test before drilling ahead, from 9,827-46 ft., recovered 3,000 ft. of water cushion in 70 minutes, but developed no pressure and yielded only 18 ft. of slightly gas-cut water. Bottom-hole flowing pressure was 1,480 psi. The test entered the Cotton Valley at 9,050 ft., on an elevation of 353 ft.

In Union Parish, Pan American Producing Co. 1 J. H. Albritton, 10-19n-1e, continued drilling below 7,476 ft., thought to be Travis Peak, after making extensive cores and drill-stem tests. At 7,230-40 ft. drill returns indicated hard sand with a show of oil. A 20-minute test at 7,213-48 ft. recovered 270 ft. of water cushion, 540 ft. of gas-cut mud, and 1,890 ft. of salt water and gas-cut mud with a show of oil. Flowing bottom-hole pressure was 1,496 psi. A test at 7,369-96 ft. flowed dry gas at the end of 5 minutes, at 800 psi. There was no distillate. Operators killed the well and cored ahead. At 7,396-7,406 ft. cores recovered sand with fair odor and distillate taste. No shows were found in coring on down to 7,457 ft.

In Arkansas, wildcat operations included Houston Oil Co. 2 H. B. Gaughan, 34-13s-16w, Calhoun County, which had total depth at 2,006 ft., and was swabbing mud,

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oil and salt water. No other details were available. In LaFayette County, 2 miles south of the Spirit Lake field, Crow Producing Co., Inc., and A. E. Stewart 1 H. Moore heirs, 25-16s-25w, was building roads. It is a 5,000-ft. wildcat, located on a seismograph prospect. Carter Oil Co. 1 H. H. Gildon, 22-16s-27w, Miller County, Smackover wildcat, was below 3,715 ft. Hunt Oil Co. 1 Mollie Purifoy, 3-12s-19w, Ouachita County, spudded and was drilling below 1,510 ft.

NORTH LOUISIANA WILDCAT FAILURES

Union County: Mid-States, Lyons & Prentiss 1 Frost Lumber Co., NE SE SW 36-23n-1w, dry, TD 2,175 ft., Arkadelphia 2,016 ft., Nacatoch 2,095 ft., elev. 131 ft.

Dan Mingledorf 1 R. L. Edwards, NW NW SW 1-22n-2e, dry, TD 2,350 ft.

ARKANSAS SUCCESSFUL WILDCAT

Union County: Mul-Berry Oil Co. 1 J. E. Martin, NE SE NE 25-18s-15w, pumped 8 bbl. 37.6°-gravity oil a day, Nacatoch sand 2,066-2,160 ft., TD.

ARKANSAS WILDCAT FAILURE

Cleveland County: Taylor Kirby Drilling Co. 1 Blankenship, SE SE 29-9s-9w, dry, TD 4,061 ft., Wilcox 1,795 ft., Midway 2,570 ft., Arkadelphia 3,210 ft., Nacatoch 3,420 ft., Nacatoch sand 3,480 ft., Saratoga 3,670 ft., Meakin 3,950 ft., elev. 250 ft.

OKLAHOMA

More Links Added to Chain Between Ceres, S. and SE.

TWO additional wells have been added to the chain that may connect the South Ceres and Southeast Ceres pools in Noble County. Kingwood Oil Co. 6 Bolay, NE NE NW 35-23n-1w, with casing set 4,422 ft. in the Bartlesville and a total depth of 4,481 ft. flowed 345 bbl. in 12 hours through ⅜-in. choke.

Fourdee-Rhodes Oil Co. 3 Burnside, NE SW SE 26-23n-1w, flowed at the rate of 100 bbl. per hour and will be pinched back to the field allowable. Operators have staked 4 Burnside, SW SW SE of the same section to complete the test of the string between the two pools, while Kingwood will drill 1 William Stegeman, SE SE SW 26-23n-1w, an offset to the 4 Burnside.

Carter Oil Co. has added a new pay zone in the Katie pool at 1 G. O. Christian, C SE SW 5-1n-1w, Garvin County. A test of two sands between 5,433 ft. and 5,521 ft. had gas in 3 minutes and oil in 5 minutes. When turned into tanks, oil flowed 23 bbl. per hour.

Anderson-Prichard Oil Corp. 1 Freeman, NW NE SE 26-3n-2w, wildcat in Garvin County, flowed 25 bbl. per hour for 15 hours through ½-in. choke with a gas-oil ratio of about 1,000 to 1. Production is through perforations at 5,473-5,503 ft.

Mid-Continent Petroleum Corp. has added new life in the Cromwell field area by a new pay zone at 16 N. Jackson, SE NW SW 4-10n-8e, Seminole County. Operator found the Calvin sand at 1,742 ft. and a drill-stem test at 1,748-62 ft. with tool open for 30 minutes recovered 180 ft. of clean oil and 120 ft. of oil-cut mud. Crew found a third Calvin sand at 1,896 ft. which will be tested.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Carter Oil Co. 1 Lee-Winn, C NW NE 8-4n-3w, flowed 1,700 bbl. of 48° distillate and gaged 4,000,000 cu. ft. of gas per day from third bromide sand at 9,540-80 ft., TD 9,707 ft.

Grady County: Stanolind 1 Briscoe Unit, C NW SE 4-4n-5w, flowed 138 bbl., 142 bbl., 131 bbl., and 93 bbl. of 48°-gravity oil per day through various chokes from 13,687-15,184 ft., TD 15,184 ft. (Pay zone includes bromide, Oil Creek, McLish, and Arbuckle; most production from bromide section).

Hughes County: Cities Service 1 Nicks, NE SE NW 12-8n-10e, gaged 5,500,000 cu. ft. of gas from Booch at 2,295-2,335 ft., TD 4,330 ft.

Pontotoc County: Sohio 1 Wilfong "B," SE SE NE 34-5n-5e, pumped 110 bbl. of 40°-gravity oil per day from Viola 2,860-2,980 ft., TD 2,980 ft.

OKLAHOMA WILDCAT FAILURES

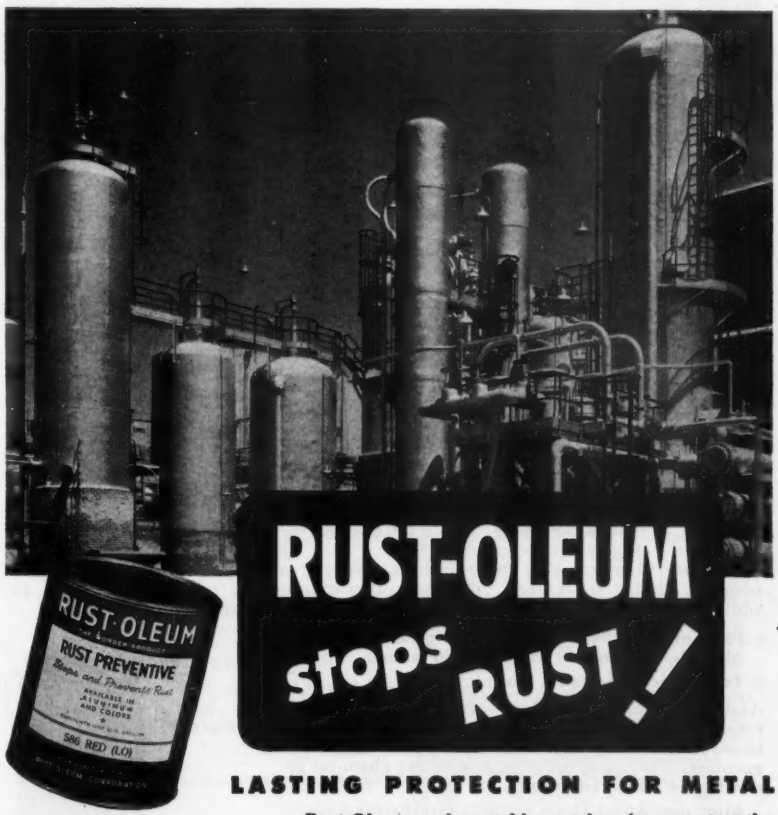
Comanche County: Morton 1 School Land, 25-1s-13w, dry, TD 2,510 ft., fusilinid lime 1,570 ft., Canyon 2,005 ft., Arbuckle 2,220 ft.

Cotton County: Ross 1 Miller, NE SE SE 8-5s-12w, dry, TD 1,835 ft., Megargel 1,824 ft.

Creek County: Bryan 1 Lewis, C S/2 SW NE 15-18n-9e, dry, TD 3,188 ft., Hogshooter 1,004 ft., Checkerboard 1,367 ft., conglomerate 1,532 ft., Oswego 1,975 ft., Prue 2,053 ft., Verdigris 2,132 ft., Red Fork 2,412 ft., Inola 2,497 ft., Bartlesville 2,540-2,610 ft., Dutcher 2,830 ft., Burgess 2,890 ft., Mississippi lime 2,896 ft., Woodford 3,138 ft., Misener 3,156 ft., Simpson 3,166 ft., second Wilcox 3,179 ft.

Garvin County: Republic Natural Gas 1 Goeske, SE NE SE 17-1n-2w, dry, TD 11,615 ft., Basal Pontotoc 6,430 ft., Mississippian Caney 8,050 ft., Pennsylvanian Caney 8,180 ft., Mississippian Caney (again) 8,530 ft., Sycamore 8,900 ft., Woodford 9,050 ft., Hunton 9,567 ft., Sylvan 9,583 ft., Viola 9,900 ft., bromide dense 10,792 ft., first bromide sand 11,060 ft., Basal bromide sand 11,507 ft.

Hughes County: Olson 1 Beymer, SE SE SE 11-9n-10e, dry, TD 3,808 ft., Wa-



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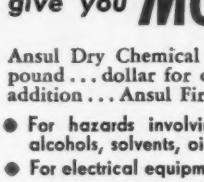

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DISTRIBUTORS IN ALL PRINCIPAL CITIES

panucka 2,785 ft., Union Valley 3,019 ft., Cromwell 3,048 ft., Woodford 3,550 ft., Hunton 3,682 ft. with no show, Sylvan 3,791 ft.

Gulf 1 Rogers, NW NW SE 3-7n-10e, dry, TD 3,733 ft., Senora 629 ft., Inola 1,742 ft., Booch 2,330-62 ft., Lower Booch 2,442-94 ft., sand 2,512-28 ft., sandy lime 2,528-82 ft., Hartshorne sand 2,618-35 ft., Gilcrease sand 2,880 ft., limy sand 3,106 ft., Wapanucka 3,270-3,328 ft., Union Valley 3,548 ft., Cromwell 3,590-3,658 ft., Lower Cromwell sand 3,662-75 ft.

Johnston County: Gutowsky 1 Barnett, NE NW SW 2-1s-6e, dry, TD 2,120 ft., no tops reported.

Kay County: Mazda 1 Sheik, NE NE SE 25-28n-1e, dry, TD 4,215 ft., Mississippi lime 3,837-4,122 ft., Misener 4,122 ft., Simpson 4,130 ft.

Okfuskee County: Wilcox 1 Harjo, SE SW NE 22-13n-7e, dry, TD 3,224 ft., Hogshooter 1,355 ft., Layton 1,458 ft., Checkerboard 8,218 ft., Oswego 2,745 ft., Prue 2,764 ft., Verdigris 2,910 ft., Skinner 2,930 ft., Red Fork 3,200 ft.

Okmulgee County: Wirick 1 McAdoo, SW SW NW 32-11n-12e, dry, TD 1,220 ft., Glen sand 1,170-96 ft.

Pottawatomie County: Ledford 1 Cook Estate, SE SE SE 25-6n-3e, dry, TD 3,335 ft., no tops reported.

KANSAS

Sedgwick County Gets Possible Pool Opener

JP. GATY 1 Phillips, NE NW SE 8-26s-2e, Sedgwick County, is reported to be bailing at the rate of about 500 bbl. per day from the Mississippian, topped at 2,954 ft. Well was drilled to 2,956 ft. and casing set six inches off bottom. Well is located about 1¾ miles northwest of the Greenwich pool and about 8 miles northeast of Wichita.

In Barber County, Lion Oil Co. had a good show of gas and recovered 660 ft. of oil on a drill-stem test at 1 De Geer, NE NE SW 2-33s-15w. Test was reported for Viola lime at 5,183-198 ft. after topping the pay at 5,156 ft.

Bay Petroleum Corp. 1 Hunter, SW SW SW 4-8s-17w, is a prospective pool opener for Rooks County. Located about 3 miles southwest of the Stockton pool, the well swabbed 4 bbl. per hour after treatment with 1,500 gal. of acid. Production is from the Arbuckle topped at 3,382 ft. with total depth of 3,399 ft. and casing set at 3,386 ft.

The Northwest Kowalsky pool in Barton County had an extension and new pay at Gough Davis and El Dorado Refining Co. 1 De Werff, NE SE SE 25-20s-12w. Production is from Lansing-Kansas City through perforations at 3,188-92 ft. and 3,314-16 ft. Other Kowalsky production is from the Arbuckle.

The Texas Co. has a possible pool opener at 1 Berland, NE SE SW 19-10s-19w, 3 miles east of the Marcotte pool in Rooks County. A drill-stem test of the Arbuckle at 3,803-07 ft. recovered 200 ft. of oil and 85 ft. of oil-cut mud.

For the week, 80 locations were recorded with 13 reported for Rice County. Barton County had a total of 8 locations followed by Marion with a report of 5.

KANSAS SUCCESSFUL WILDCATS

McPherson County: Westgate-Greenland 1 Ruth, NE NE SW 13-18s-1w, produced 317 bbl. of 39°-gravity oil per day from Mississippian at 2,811-26 ft.; Lansing 2,240 ft., TD 2,826 ft. Old well worked over.

Don Ingling 1 Miller, SE SE NW, 1-18s-11w, produced 858 bbl. of 35°-gravity oil per day from Mississippi chat at 2,844-2,851 ft., TD 2,851 ft.

Rice County: S. G. Holl & Tom Allen 1 Turner, SE SE SE 6-21s-6w, pumped 40 bbl. of oil per day from Mississippian at 3,498-3,507 ft.; conglomerate 3,484 ft., TD 3,507 ft.

Stafford County: Phil-Han 1 Huffard, SW SW NW, produced 368 bbl. of 30°-gravity oil per day from Arbuckle at 3,755-70 ft.; conglomerate 3,655 ft., Viola 3,661 ft., Simpson 3,698 ft.

KANSAS WILDCAT FAILURES

Barber County: Superior Oil Co. 1 Roy Ott, SW NE SW 6-34s-13w, dry, TD 5,512 ft., Lansing 4,134 ft., Kansas City 4,295 ft., Mississippian 4,869 ft. with show of gas, Viola 5,190 ft., Simpson shale 5,319 ft., Simpson sand 5,344 ft., Arbuckle 5,473 ft.

Barton County: Nadel & Gussman 1 Putman, NW NW NE 17-17s-13w, dry, TD 3,551 ft., anhydrite 870 ft., Lansing 3,195 ft., conglomerate 3,422 ft., Arbuckle 3,540 ft.

M. & L. Oil Co. 1 Wagner, NE NE SW 23-19s-12w, dry, TD 3,399 ft., anhydrite 930 ft., Douglas 3,038 ft., Lansing 3,111 ft., Aruckle 3,367 ft., slight show of oil at 3,378 ft., bailed 1 bbl. of oil in 6 hours.

United Petroleum Corp. 1 Dalziel, SE SE NW 8-18s-11w, dry, TD 3,395 ft., anhydrite 600 ft., Heebner 2,933 ft., Lansing 3,058 ft., Arbuckle 3,343 ft., no show.

Butler County: Whittaker 1 Byers, NE SE NE 17-28s-7e, dry, TD 2,855 ft., Lansing 1,680 ft., Kansas City 1,990 ft., Mississippian 2,695 ft.

Shell Oil Co. 1 Brown "A," NE SE SE 23-25s-6e, dry, TD 2,795 ft., no tops reported.

Ellis County: Helmerich & Payne 1 Engle, NE NE NW 34-14s-18w, dry, TD 3,709 ft., Heebner 3,290 ft., Lansing 3,339 ft., conglomerate 3,621 ft., Arbuckle 3,655 ft.

Derby Oil & Peel 1 Wann & Blake, C W/2 NW NW 27-14s-20w, dry, TD 3,809 ft., Lansing 3,431 ft., Basal Kansas City 3,688 ft., Marmaton 3,727 ft., Regan sand 3,791 ft.

Graham County: National Cooperative Refining Association 1 Hibbits, NE NE SW 12-7s-21w, dry, TD 3,700 ft., anhydrite 1,730 ft., Heebner 3,346 ft., Lansing 3,370 ft., conglomerate 3,619 ft., Arbuckle 3,649 ft.

Kingman County: Continental Oil Co. 1 Deweese, NW SW NE 11-27s-10w, dry, TD 4,504 ft., Lansing 3,497 ft., Mississippian 4,024 ft. with show of oil and gas, Viola 4,301 ft., Simpson 4,382 ft., Arbuckle 4,470 ft.

Marion County: Jones & Crumpacker 1 Stutzman, NE NE NE 11-21s-3e, dry, TD 2,832 ft., Lansing 1,885 ft., Mississippian 2,450 ft., Kinderhook 2,562 ft., Misener 2,703 ft., Hunton 2,704 ft., Sylvan 2,712 ft., Viola 2,720 ft., Simpson dolomite 2,805 ft., Simpson sand 2,820 ft., no show.

McPherson County: Cities Service 1 Johnson, SE SE NW 35-20s-2w, dry, TD 3,561 ft., Lansing 2,311 ft., Mississippian 2,950 ft., Basal Mississippian 3,236 ft., Maquoketa 3,340 ft., Viola 3,410 ft., Simpson 3,439 ft.

Rush County: Westgate-Greenland 1 Ochs, SW SW NW 21-17s-16w, dry, TD 3,750 ft., anhydrite 1,195 ft., Lansing 3,395 ft., Basal Kansas City 3,625 ft., quartzite 3,712 ft., Arbuckle 3,720 ft., Pecan sand 3,749 ft.

Russell County: Ed Koester & J. Morgan 1 Boller, SE SW SW 11-14s-13w, dry, TD 3,395 ft., Topeka 2,645 ft., Heebner 2,947 ft., Lansing 3,010 ft., conglomerate 3,318 ft., Arbuckle 3,374 ft.

Sedgwick County: E. H. Adair 1 Frank Roy, NE NE SE 25-29s-1w, dry, TD 3,875 ft., Kansas City 2,778 ft., Mississippian 3,363 ft., Viola 3,790 ft., Simpson 3,795 ft., Arbuckle 3,842 ft.

Stafford County: Armer 1 Garner, SE SE NE 35-25s-14w, dry, TD 4,466 ft., anhydrite 885 ft., Lansing 3,736 ft., Mississippian 4,210 ft., Arbuckle 4,451 ft.

Crown Oil 1 Voight, NW NW SW 12-22s-12w, dry, TD 3,695 ft., Lansing 3,263 ft., cherty conglomerate 3,542 ft., Viola 3,532 ft., Simpson shale 3,571 ft., Simpson sand 3,594 ft., Arbuckle 3,635 ft.

APPALACHIAN FIELD

Deep Test Being Plugged at 6,625 Ft.

PITTSBURGH.—In Steele district, Wood County, West Virginia, the deep wildcat of United Fuel Gas Co. on M. A. Webber farm failed of production through the Clinton sand and Red Medina and is being plugged at 6,625 ft. In Malden district, Kanawha County, this company logged the Newburg horizon at 5,929-50 ft. in the wildcat on the A. H. Boyd farm. The surface elevation is 1,059 ft. and casing was run to 5,972 ft.

In the Ravenswood district, Jackson County, in the vicinity of the two oil wells which produced, initially, 50 bbl. a day from the Berea, six tests are drilling and six rigs standing for test with two other locations. Drilling are the following: Columbian Carbon Co. 1 J. A. Suck; Ellsworth Jordan 2 W. H. Moore; K. M. Hunt 1 Shirley McMurray; Kentucky Oil & Gas Co. 1 R. L. Moore; F. S. Deem 1 Della Bowman; Spartan Gas Co. 1 Julia Cayton. Rigs standing are Ellsworth Jordan 1 W. H. Moore, Town Lot; K. M. Hunt 2 and 3 Shirley McMurray; Reed, Dodd & Bartlett 1 S. A. McMurray; E. F. Engle et al 1 T. M. White; E. Reynolds 1 Russell Staats. Locations are Conner et al 1 Walter Hanning; Parkersburg Oil & Gas Co. 2 Anna L. Pepper.

New locations totaled 16 and in Union district, Barbour County; Otter district, Braxton County; Cross Creek district, Brooke County; Glenville district, Gilmer County; Elk district, Kanawha County; Court House district, Lewis County; Harts Creek district, Lincoln County; Clear Fork district, Raleigh County; Lincoln and Stonewall districts, Wayne County; Walk-

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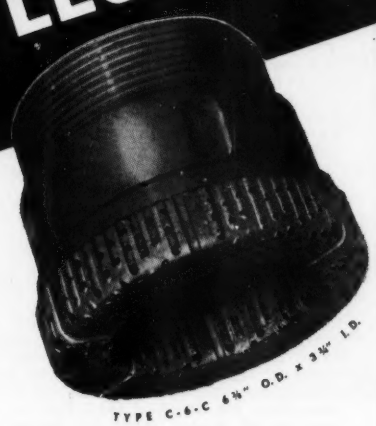

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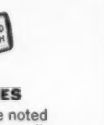

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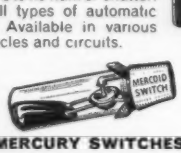

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er district, Wood County; Center and Oceana districts, Wyoming County.

On Chestnut Ridge in Springhill Township, Fayette County southwest Pennsylvania, or the southern end of the wildcatting, New Penn Development Co. et al topped the Onondaga lime at 7,755 ft., and the chert at 7,795 ft. in the wildcat on J. R. Smiley. With elevation of 2,310 ft., this test appears running lower on structure than previous southern tests.

In East Fallowfield Township, Crawford County, the northwest part of the state, Sylvania Corp. continues drilling the wildcat on Ellen Calvin farm and below the Oriskany sand (3,430-48 ft.) logged salt water at 4,425-35 ft., white sand 4,655-63 ft., 2,000 cu. ft. gas at 4,665 ft., red shale 4,663-76 ft., red sand and shale 4,676-87 ft., white sand 4,687-96 ft., drilling 4,736 ft.

New locations totaled seven and are in Burrell, Madison, Plum Creek and South Bend townships, Armstrong County; Conemaugh Township, Indiana County; Amwell and Morris townships, Washington County.

(Continued on page 163)

OHIO, KENTUCKY

Stark County Gets Good Gas Well

COLUMBUS.—William Pfeiffer, after failing to extend the Navarre pool to the west, moved north and drilled in a big well on Charles Guspyt, Section 31, Perry Township, Stark County. Packer shell at 4,075-4,105 ft. gaged 304,000 cu. ft. of gas, and white Clinton at 4,182-4,204 ft., and additional 5,714,000 cu. ft. of gas. The well is to be tubed natural.

The Wittmer Co. has staked a location for its deep test on William O. Wortman, Section 24, Bristol Township, Morgan County. John Morrow's wildcat on Murray, 4½ miles to the south in Meigsville Township, is drilling past 4,000 ft. Only a small gas show was found in the Oriskany.

The Clinton Oil 2 Myrtle Forsythe, Section 28, Madison Township, Perry County, filled 2,500 ft. with oil, natural, and after a 125-qt. shot, made 142 bbl. in 42 hours. Clinton was found at 3,296-3,350 ft. In the same pool, the Mid East Oil 1 Francis Love was drilled deeper from the Berea sand to the Clinton, logged at 3,360-3,400 ft. Fifty barrels of oil were swabbed natural in 44 hours and will be shot.

OHIO WILDCAT FAILURE

Lawrence County, Symmes Township: Ewen & Huddley 1 O. C. Collins, Sec. 10, dry in Medina, TD 2,755 ft.

EASTERN KENTUCKY

ASHLAND.—Three completions were reported in the Eastern Kentucky field of operations during the week. Kentucky-West Virginia Gas Co. completed Well No. 5,760, David Newsom, Pike County, at 3,650 ft., with 119,000 cu. ft. of gas in shale, A.S. The same company completed Well No. 5,779 Pike County, at 3,725 ft., with 245,000 cu. ft. of gas in shale, A.S., and Well No. 5,789, John H. Auxier, Johnson County, at 745 ft., with 696,000 cu. ft. of gas in the Maxon zone.

WESTERN KENTUCKY

OWENSBORO.—Sun Oil Co. has new Waltersburg production at 2 Lilly Binford, 23-O-19, Union County. A 1-hour drill-stem test at 1,792-1,805 ft. had gas in 45 minutes and recovered 1,600 ft. of clean oil and no water. Operator is continuing test of this sand for the first Waltersburg production in the area. Sun's 1 Lilly Binford, northeast of the new well, was completed in a Pennsylvania sand at 1,403-19 ft. for an initial production of 14 bbl. per day.

The important Webster County deep test, Pure Oil Co., Ashland Oil & Refining Co., and I. B. Browning 1 M. L. Walker, NE¼ 22-N-24, is expected to start about May 10 with J. G. Watkins doing the drilling.

INDIANA

EVANSVILLE.—In Gibson County, the wildcat A. E. Morrison 1 H. Haper Heirs, NW NW NW 34-1s-10w, continues on test of the McClosky, 2,027-30 ft., after setting casing at 2,020 ft. Indications are for a good well.

Another interesting wildcat location for Gibson County is George & Wrather et al 1 Will Blair, SE SW NE 14-2s-12w, an open area in the western part of the county about 4 miles from the state line.

George & Wrather et al 5 "B" L. & A. Kieffer, SE SE SE 26-1s-12w, Gibson County, has been completed in the Upper Cypress at 1,950-71 ft. for an initial production of 220 bbl. per day. Total depth is 2,098 ft.

INDIANA WILDCAT FAILURES

Gibson County: Ashland Oil & Refining Co., J. Buchman, and C. E. O'Neal 1 James McCormack, NW SE NW 15-2s-10w, dry, TD 2,090 ft.

ILLINOIS

Fairfield Pool Gets New Pay

MATTOON.—Possible production from the McClosky at Robinson-Puckett, Inc., 1 B. E. Puckett "B," SW NW NE 17-2s-8e, Wayne County, will add a new pay for the area. Operator is setting casing in the McClosky after a drill-stem test at 3,350 ft. had a flow of clean oil in 10 minutes. Other production is from the Aux Vases. The B. E. Puckett "A," NE NW NW 26-2s-8e, is on pump to test the Aux Vases at 3,186-94 ft.

In White County, V. R. Gallagher 1

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Hoerner, SW NE NW 28-3s-8e, is testing the McClosky after perforating casing at 3,417-25 ft. Crew swabbed 50 bbl. of oil with a trace of water in 8 hours. Total depth is 3,448 ft.

ILLINOIS SUCCESSFUL WILDCATS

Coles County: H. C. Sanders 5 R. M. Childress, NE SE SW 30-13n-11e, IP 27 M.c.f. gas, 240-60 ft., TD 342 ft.

ILLINOIS WILDCAT FAILURES

Morgan County: Hed Oil Co. 1 E. Mahon, SW SE NE 8-15n-9w, dry, TD 300 ft.

Edgar County: G. L. Bryant 1 Bussart, SE SE NE 9-13n-13w, dry, TD 534 ft.

J. C. Bruner 3 Landier, SE NE SE 9-13n-13w, dry, TD 475 ft.

Montgomery County: Edgar White 1 F. Nolan, NE SE SE 23-7n-2w, dry, TD 1,155 ft.

Hancock County: Dale E. Lambert 1 D. Boeddeker, SW NE SW 23-7n-8w, dry, TD 1,000 ft.

Saline County: Calvert & Willis et al 1 A. Cole, SE SW NE 20-7s-6e, dry, TD 3,126 ft.

PERMIAN BASIN

Sterling County Discovery Fills Storage Tanks

MIDLAND.—Anderson Prichard Oil Corp. and Vickers Petroleum Co., Inc., 1 Marvin Frances Foster, Sterling County discovery in the Wichita Albany of the lower Permian, filled all available storage tanks at the rate of 1,056 bbl. of oil a day and was shut in. When tanks are emptied operators will make official completion tests.

After washing with 1,000 gal. of mud acid, the well kicked off and flowed into pits for 45 minutes before being turned into tanks. In 14 hours, presumably through open 2-in. tubing, it tanked 615 bbl. of 29°-gravity oil, with no water. Pay zone is 4,252-4,305 ft. The well is located 7½ miles south of Sterling City, in SW SW Section 12, Block 15, H&TC Survey.

Seaboard Oil Co. of Delaware 1 Dora Campbell, second well in Vealmore field of Howard County, 14 miles north of Big Spring, logged additional pay zone in drilling to 7,877 ft. On a 24-hour test of open hole from 7,846-77 ft., with 7/16-in. bottom-hole choke, gas came to the surface in 4 minutes, drilling mud in 17 and flowing oil in 20 minutes: During the first hour it gaged 91 bbl. of oil through ¾-in. top choke; then 353 bbl. of oil in 18½ hours through ¼-in. top choke. Changed to ⅜-in. top opening, it gaged 110 bbl. in 4 hours. Total flowing time of 24½ hours was 554 bbl. of 42°-gravity oil, with no water. Flowing pressure varied from 630 to 735 psi. All fluid was circulated out of the drill pipe and operators perforated casing at 7,810-35 ft. It was to be completed from open hole between bottom of casing at 7,835 ft. to total depth of 7,877 ft., and from the casing perforations.

Southeast Hale County's discovery, General American Oil Co. 1 A. F. Byrd, 3 miles northeast of Petersburg, was completed on the pump for 118.3 bbl. of 40.5°-gravity oil, plus about 50 per cent water, in 23 hours. Pay section in Pennsylvanian limestone between 5,820-5,902 ft., plugged back total depth. The well was drilled to 6,745 ft., in the pre-Cambrian.

Offset tests to the 1 Byrd were getting under way. On the east side, Lario Oil & Gas Co. was to do the drilling for General American at the 1 Bob Mayo. It is 1,980 ft. west and 660 ft. from south lines of Section 18, Block K, TTRR Survey. Surface casing had been set on last report. In Section 19, Block K (Floyd County), H. E. Chiles, Jr., was ready to spud in the 1 Flora C. Strickler. Drilling permit was for 8,200 ft.

The discovery, 1 Byrd, was originally drilled by Humble, Stanolind, and Standard of Texas, and abandoned when it went from the Mississippian into pre-Cambrian.

New field locations totaled 59, while 10 counties gained a total of 12 wildcats.

WEST TEXAS (DISTRICTS 8 & 7-C) SUCCESSFUL WILDCAT

Hockley County: George P. Livermore, Inc., 1 David Parsons, Lab. 25, Lge. 30, Baylor CSL, 4½ mi. SW Levelland, flowed 188 bbl. 32°-gravity oil a day, open 2-in. tubing, San Andres 4,865-4,909 ft., TD, elev. 3,544 ft., south extension to Levelland-Whiteface area.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Pecos County: Bond Oil Corp. et al B. F. Smith, Sec. 12, Blk. 145, T&St.L. Sur., 22 mi. SW McCamey, dry, TD 2,208 ft., no shows.

R. R. Herrell 1 J. G. Crockett and R. R. Herrell, Sec. 26, Blk. 2, H&TC Sur., 2 mi. E Buena Vista, dry, TD 5,518 ft., Yates 1,190 ft., San Andres 2,240 ft., elev. 2,371 ft.

Jesse Russell et al 1 Lowery & Wilson, Sec. 46, Blk. Z, TCRR Sur., 1 mi. N White and Baker field, dry, TD 2,143 ft., Grayburg 1,960 ft., elev. 2,845 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURE

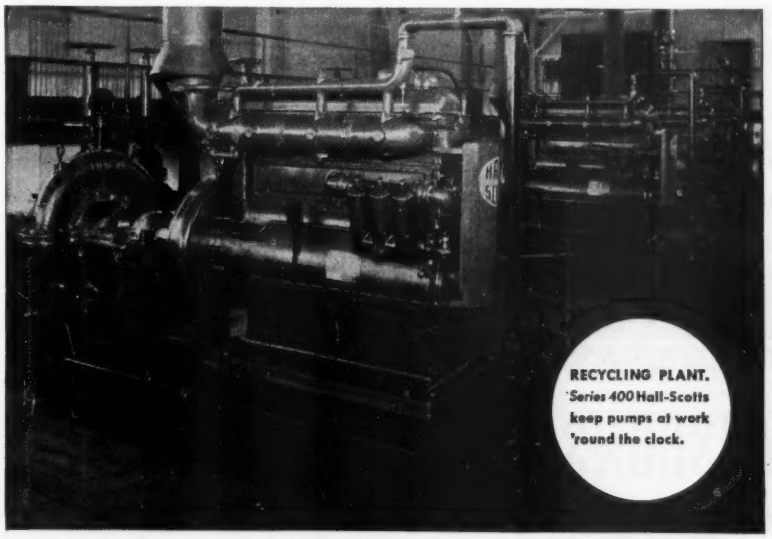
Donley County: Rogers 1 Ballew, Sec. 56, Block C-6, GC&SF Sur., 1½ mi. S Clarendon, dry, TD 1,280 ft., no shows.

SOUTHEASTERN NEW MEXICO

HOBBS.—No official information has been released on Mid-Continent Petroleum Corp.'s 1-A Sawyer, prospective Ellenburger discovery in 27-9s-36e, northeast Lea County. Corrected total depth was said to be 12,258 ft., from 12,249 ft., and 5½-in. casing has been set at 12,255 ft. This well is reported to have recovered considerable free oil on drill-stem tests from 12,099 ft. to total depth.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Eddy County: Harvey E. Yates 1 Yates-



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CANADIAN FIELDS

Important Extension Indicated for Leduc Field

CHATHAM.—Southwest of Leduc field, Continental-Leduc 2, LSD 1, 9-50-26w4, in a drill-stem test of the D-3 zone gave an oil rise in 15 minutes and after setting 7-in. at 5,414 ft., is being put on production. The well is an easterly offset to Continental 1, which extended the field to the south.

Okalta 2, LSD 10, 33-49-26w4, has tanks up and is swabbing into production. This, the first producer drilled south of Township 50, indicates an important extension of the field, if not a new producing area. Muddy conditions prevelant throughout the field may compel shutting down until it is possible to move the oil by truck. Okalta-Leduc 3 has been spotted in LSD 9, 33-49-26w4, immediately to the east.

To the west of the field, Globe 7, LSD 5, 10-50-26w4, at 5,353 ft. has been swabbed, indicating a strong commercial well, and is being cleaned out and placed in production. Globe 5, LSD 16, 34-50-26w4, a north-end well, is nearing completion.

Imperial 24, LSD 12, 35-50-26w4, in the northeast section of the field, has set 7-in. at 5,099 ft., after regaining circulation, and is testing. Imperial 45, LSD 10, 9-50-26w4, is reaming D-2 zone below 5,245 ft. Imperial 51, LSD 6, 28-50-26w4, finished at 5,326 ft., is swabbing into production. Imperial 52, LSD 16, 20-50-26w4, in drill-stem test at 5,024-5,112 ft., showed 800,000 cu. ft. with oil, in 12 minutes, and at 5,115-60 ft. gave 150,000 cu. ft. with 1,456 ft. recovery of oil and some mud and salt water. Finished at 5,327 ft. it is trying to recover lost circulation. Imperial 56, LSD 6, 34-50-26w4, completed in D-2 zone at 5,302 ft., is swabbing.

Two new outpost tests are drilling. Consolidated Homestead 1, LSD 9, 31-51-25w4, east of the Woodbend extension and located on the Edmonton golf course, is below 1,975 ft. In the Calmar area, south and west of the Leduc field, Texaco-McColl-Calmar 1, LSD 6, 36-49-27w4, is below 4,565 ft.

Lloydminster.—The Lloydminster producing area on the Alberta side has been extended a mile north of Shamrock 1, LSD 6, 21-50-2w4, finished at 1,925 ft., which is pumping 60 bbl. Farther east and south, Command-Lloydminster 3, LSD 11, 16-50-1w4, at 1,958 ft. has 50 bbl. daily. C. L. 7, LSD 14, 16-50-1w4, at 1,952 ft. has 50 bbl. Dalo 6, LSD 10, 15-50-2w4, at 1,998 ft. has 40 bbl. daily. Royal Canadian Lloyd 2, LSD 1, 15-50-2w4, at 2,003 ft. has 50 bbl. daily. Imperial-H. B. Blackfoot 3, LSD 1, 23-50-2w4, is testing at 1,980 ft. Lloydminster Oil Producers 1, LSD 12, 10-50-2w4, has been abandoned at 2,016 ft. Granleduc 3, LSD 7, 14-50-2w4, has spudded.

Kinsella.—Northwestern Utilities of Edmonton has announced a drilling program of three wells in Kinsella field. Locations are: Northwestern 27, LSD 6, 33-48-10w4; Northwestern 28, LSD 6, 35-48-10w4, and Northwestern 29, LSD 11, 23-48-10w4. Wells are being drilled to increase the company's natural-gas reserves.

CALIFORNIA

New Open-Hole Record Set in California

LOS ANGELES.—Although Standard Oil Co. of California 1 Houghton Community, deep test in the Santa Fe Springs area of Los Angeles County, has been abandoned, it is thought that the well may have established an all-time record for drilling in open hole. The well was bottomed at 14,427 ft., with 13⅜-in. casing set to 1,125 ft., leaving 13,302 ft. of open hole, definitely a new record for California, and possibly a world's record for such wells.

In Solano County, approximately 2 miles northeast of Potrero Hills gas field, Honolulu Oil Corp. 1 McCormick Estate, 36-5n-1w, appears to have made a natural-gas discovery, blowing 3,800,000 cu. ft. per day on recent tests at 1,900 ft. The operator

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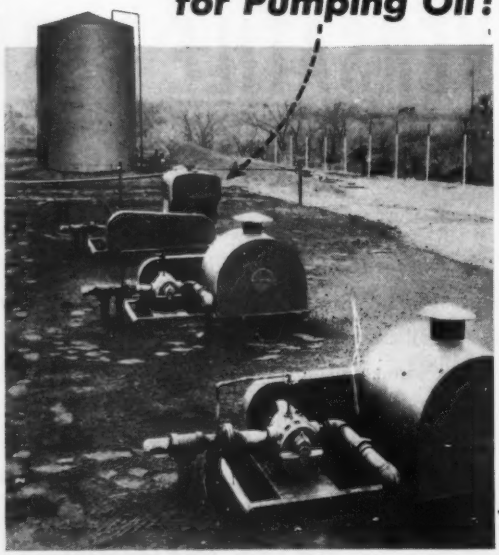

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continues to core ahead in an attempt to determine the extent of the gas zone.

Jergins Oil Co. et al have started another test, the 1 Orradre, about 3½ miles southeast of The Texas Co. 1 Lombardi, 1947 discovery of the San Ardo field in southern Monterey County.

ROCKY MOUNTAIN

Attempts at Extension Fail in Sand Draw

DENVER.—Attempts to extend the Tensleep producing limits of Sand Draw field approximately 2 miles south failed this week when Sand Draw Oil Co. plugged back the South Sand Draw deep test. The well is 1 Downey, NE NE NW 26-32n-95w, and found the Dinwoody at 8,465, Phosphoria 8,530, and Tensleep 8,920 ft. The Tensleep was hard and tight and the operator reported no saturation. Two drillstem tests in the Phosphoria showed a slight trace of oil and gas with no water. The well location was based on faulting between the South Sand Draw Unit and the field proper. The well may have crossed a fault as electric log showed a loss of 800 ft. of structure in the Jurassic section. A year ago a gas extension, or discovery, was made on this unit in the Frontier and the present test logged gas in the Morrison and the well has now been plugged back from 8,956 ft., total depth, to test the basal Morrison zone.

The well has been of interest as the first of several Tensleep tests scheduled in the general Sand Draw area. British American Oil Producing Co. is now drilling a test at Longs Creek, 2 miles southeast of the Sand Draw Oil Co. deep test, and the Longs Creek well may be drilled to Tensleep, depending upon results from upper beds. Northwest of Sand Draw at Beaver Creek field, Stanolind Oil & Gas Co. is moving in rotary for a test to the Madison below 10,000 ft. Beaver Creek produces gas from the Morrison at around 8,500 ft. Immediately north of Beaver Creek in the Riverton area Atlantic Refining Co. has made location for an interesting wildcat at 1 Tribal, C SW SE 25-1s-4e (WRM), and although contract depth is Frontier at around 7,500 ft., it is probable the well will be drilled to deeper beds. Sinclair-Wyoming Oil Co. is now completing two Tensleep oil wells in Sand Draw field proper and has developed a large oil reserve in that formation in the field with five Tensleep producers flowing approximately 7,000 bbl. of oil daily.

Pure Oil Co. is now running gamma-ray log of its deep West Poison Spider Unit wildcat located in C NW SE 11-33n-84w, Natrona County, Wyoming, at 14,303 ft., total deptn. The well has logged saturated sand below 14,211 ft., possibly in the Frontier formation, but definite correlation of formations is difficult because this is the first deep test in this area. No tests have been made of the well below 10,000 ft., although 2 weeks ago Pure encountered shows of oil and gas below 13,800 ft. It is reported in Casper, but not confirmed by Pure, that cores below 14,210 ft. showed good saturation and that the well blew out 10-lb. mud 10 ft. above the derrick floor before control gates were closed. Mud was increased to 14 lb. weight at the blowout depth of 14,253 ft., and drilling and coring continued.

Shows of oil were encountered by Carter Oil Co. in the fourth wildcat test of the Vernal Unit in northeastern Utah. On drill-stem test at 5,468-5,482 ft. this well made 25 ft. of oil-and-gas-cut mud and 10 ft. of 22.8°-gravity oil in 1 hour. The well is located in C SE SW 33-5s-21e. Flowing pressure on the test was 0 lb. The operator is now drilling below 5,647 ft.

Top of the Frontier formation was found at 6,182 ft., 20 ft. higher than in the discovery well 4 miles south in the Sand Creek area, in General Petroleum Corp. 65-2-G, NE NW SE 2-46n-91w, North Sand Creek area, Washakie County, Wyoming. The well is of importance as a test of a separate high in the Sand Creek-South Fork area where General Petroleum has made two discoveries on seismic highs in the past year. General Petroleum is now drilling below 6,500 ft. in the Frontier formation on the wildcat test. In Sand Creek field proper the operator is now below 7,600 ft. on the first well to be drilled below the Frontier formation, where the company now has three productive wells. The deep test in this area is Well 43-26-G, NE SE NW 26-46n-91w, and third Frontier was topped at 6,709 ft. The well will be drilled to the Phosphoria (Embar) and possibly Tensleep below 10,000 ft.

New locations.—Thirty new locations were made, with 20 of the wells in Wyoming and 5 each in Colorado and Montana. The majority of the new locations in Wyoming were for pool wells, with several important extensions. Bay Petroleum Co. and M. O. Lanam and C. E. Weir of South Dakota gave contract to Carey Drilling Co. of Denver for an interesting wildcat in the Lodgepole area, 15 miles west of Mush Creek pool, Weston County, Wyoming, at 1 Christensen-Davis, C NW SE 9-44n-66w.

WILDCAT FAILURE IN COLORADO

Derby Dome, Adams County: Suhr, Trickett & Fiedler 1 Miller, SE NE SW 19-3s-66w, 5,702 TD, temp. abnd., Hygiene 5,290 ft., elev 5,358 ft. ground.

WILDCAT FAILURE IN UTAH

Last Chance, Emery County: Mountain Fuel Supply 1-A Unit, NW SE NW 18-26s-7e, 8,518 ft., abnd., Navajo 204, Kayenta 1,250, Wingate 1,387, Chinle 1,730, Sinarump 1,818, Moenkopi 1,950, Sinbad 2,768, Lower Moenkopi 2,870, Kaibab 3,000, Coconino 3,075, Pennsylvania 4,035, Mississippian 4,630, Undifferentiated Paleozoic 5,575 ft., elev. 6,109 ft. RB.

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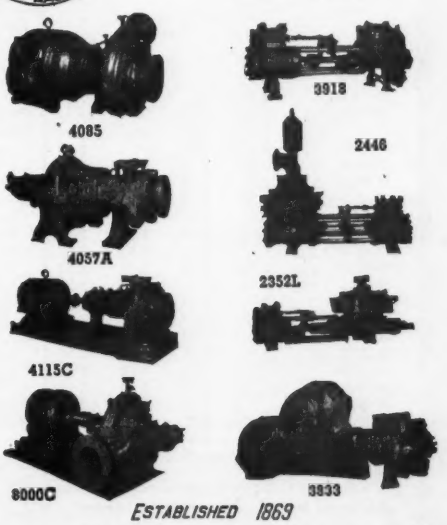

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 1, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	34	17	0	*17	39,401	528	431	0	0	0	0	0	0	0	0	0	0
Pennsylvania	49	22	2	†25	105,146	934	1,022	0	0	0	0	0	0	0	*6	11	17
West Virginia	13	4	8	1	41,503	242	267	0	0	2	1	3	2	0	18	24	44
Ohio	28	5	8	15	67,245	413	420	0	0	0	1	1	1	0	7	12	20
Indiana	17	10	1	6	28,506	302	185	0	0	0	1	1	4	0	1	9	14
Kentucky	13	4	3	6	27,732	204	172	0	0	0	0	0	2	0	0	6	8
Illinois	38	17	2	19	87,094	617	629	0	0	1	6	7	11	0	1	106	118
Michigan	10	2	1	7	28,390	206	201	0	0	1	6	7	6	0	6	85	97
Kansas	68	38	2	‡28	229,657	860	825	4	0	0	17	21	13	0	1	115	129
Neb., Mo., Iowa	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Oklahoma	82	60	1	21	305,416	1,240	1,336	2	1	1	11	15	42	4	9	198	253
Texas	219	133	8	78	1,054,371	3,559	2,800	6	1	3	36	46	100	10	38	630	778
North Central (Dist. 7-B & 9)	68	38	1	‡29	189,670	1,071	880	3	0	0	14	17	39	0	6	203	248
West (Dist. 7-C & 8)	43	34	0	9	180,870	948	659	1	0	0	3	4	15	0	1	69	85
Panhandle (Dist. 10)	13	9	1	‡3	39,030	198	143	0	0	0	1	1	0	0	1	6	7
Eastern (Dist. 5 & 6)	9	4	1	4	52,158	182	161	0	1	0	2	3	4	1	0	46	51
Gulf Coast (Dist. 2 & 3)	44	26	2	16	271,485	567	529	1	0	0	10	11	26	8	8	144	186
Southwest (Dist. 1 & 4)	42	22	3	17	322,158	593	428	1	0	3	6	10	16	1	22	162	201
Louisiana	49	36	1	12	234,795	640	390	3	1	0	5	9	11	7	1	64	83
Northern	31	22	1	8	75,164	420	189	0	0	0	2	2	0	0	0	32	32
Southern	18	14	0	4	159,631	220	201	3	1	0	3	7	11	7	1	32	51
Arkansas	9	5	1	3	32,071	104	78	1	0	0	1	2	3	0	0	29	32
Mississippi	7	5	0	2	52,704	125	117	0	0	0	1	1	2	0	3	28	33
Southeastern States	0	0	0	0	0	14	15	0	0	0	0	0	0	0	0	12	12
Montana	5	1	1	3	17,950	77	55	0	0	0	0	0	1	0	0	7	8
Wyoming	9	7	0	2	38,427	127	74	0	0	0	0	0	7	0	0	15	22
Colorado-Utah	4	1	0	3	21,629	82	57	0	0	0	2	2	0	0	0	16	16
New Mexico	17	11	1	5	60,430	215	173	0	0	0	1	1	3	1	0	15	19
California	66	55	0	11	231,979	930	659	2	0	0	11	13	16	0	0	94	110
Total United States	737	433	40	264	2,704,445	11,419	9,908	18	3	8	100	129	224	22	91	1,476	1,813
Total previous week	688	398	30	260	2,406,829	10,682	9,381	16	2	4	99	121	206	19	83	1,376	1,684
Total May 3, 1947	527	277	56	194	1,857,695			5	0	7	78	90	210	25	53	1,213	1,501

Service wells included: *17, †23, ‡1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Okla-homa, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED APRIL 24

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	860	2,127	359	1,011	1,603	25,135	4,911	9,251	7,439
Appalachian:									
District 1	100	291	54	69	88	2,193	216	319	307
District 2	64	229	28	47	102	1,054	111	171	100
Ind., Ill., Ky.	910	2,974	448	884	1,116	21,898	1,963	4,030	3,072
Okla., Kans., Mo.	421	1,379	247	474	516	9,969	723	1,752	1,439
Inland Texas	265	1,009	91	191	431	3,936	483	350	933
Texas Gulf Coast	1,385	4,106	761	2,174	1,841	17,836	1,227	4,759	5,393
La. Gulf Coast	440	1,245	331	677	557	5,786	1,030	2,024	1,464
N. La. and Ark.	81	219	68	102	136	1,855	553	548	144
Rocky Mountain:									
New Mexico	12	43	4	12	27	96	25	20	29
Other Rocky Mtn.	141	453	31	154	264	3,180	119	666	732
California	838	2,440	30	1,036	2,196	18,190	1,120	10,347	28,520
April 24, 1948	5,517	16,515	2,452	6,831	8,877	111,128	12,481	34,237	49,572
April 17, 1948	5,521	16,588	2,390	7,091	8,755	110,838	12,015	33,985	49,110
April 26, 1947	4,709	14,326	2,157	5,394	8,131	102,026	9,807	30,636	42,280

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 221,652,000 bbl. as of April 24—down 423,000 bbl. One year ago 235,383,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$2.65
Kettleman Hills, California*	2.14
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	5.00
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

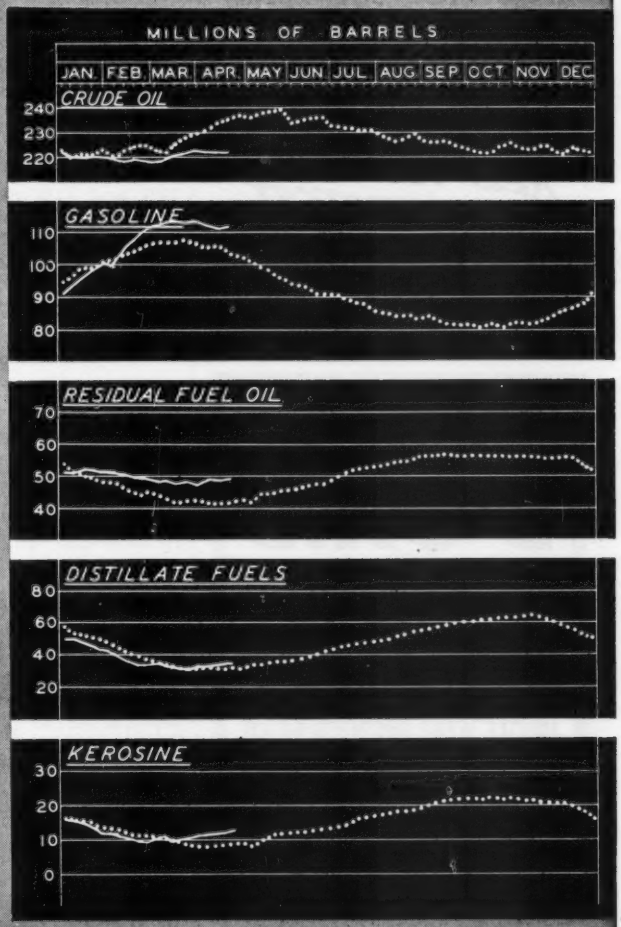
	May 1 crude oil	B. of M. April demand	April 24 crude oil
Alabama	1,000	1,500	1,050
Arkansas	88,600	83,000	88,250
California	944,600	930,000	944,500
Colorado	44,650	48,000	44,030
Eastern	65,250	64,900	62,900
Florida	825	1,000	800
Illinois	169,900	178,000	171,500
Indiana	21,000	16,000	20,600
Kansas	296,400	304,000	300,700
Kentucky	24,800	26,000	24,900
Louisiana	482,750	475,000	482,250
North Louisiana	128,350	.....	127,850
South Louisiana	354,400	.....	354,400
Michigan	45,200	46,000	45,700
Mississippi	117,835	116,000	122,735
Montana	22,740	24,000	23,050
Nebraska	450	600	450
New Mexico	127,600	129,000	127,600
Oklahoma	417,300	415,000	409,400
Texas	2,419,000	2,450,000	2,419,000
Dist. 1 (Southwest)	25,800	.....	25,800
Dist. 2 (Southwest)	172,350	.....	172,350
Dist. 4 (Southwest)	253,400	.....	253,400
Dist. 3 (Gulf Coast)	493,300	.....	493,300
Dist. 5 (Eastern)	46,125	.....	46,125
Dist. 6 (Eastern)	121,400	.....	121,400
East Texas Field	316,500	.....	316,500
Dist. 7-C (West)	44,400	.....	44,400
Dist. 8 (West)	679,325	.....	679,325
Dist. 7-B (W. Central)	44,550	.....	44,550
Dist. 9 (N. Central)	137,600	.....	137,600
Dist. 10 (Panhandle)	84,250	.....	84,250
Wyoming	139,970	142,000	141,570
Total United States	*5,429,870	5,450,000	5,430,985
Change from prev. wk., dn.	1,115		

Total production January 1-May 1 ..... †661,297,070 bbl.
Same period last year (crude plus cond.).. 584,124,845 bbl.

*Not incl. 56,430 bbl. condensate. †Incl. 6,368,605 bbl. condensate.

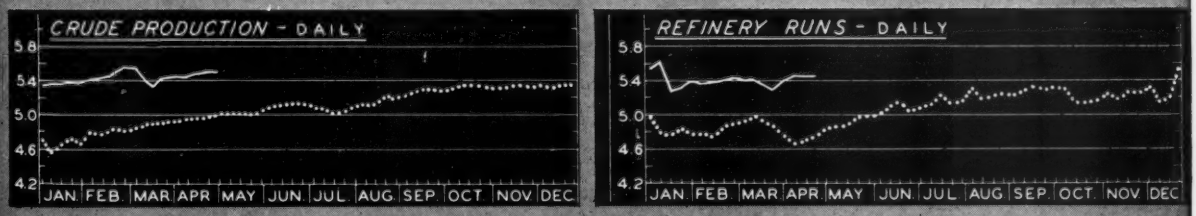
STOCKS IN UNITED STATES

---- 1947 ——— 1948



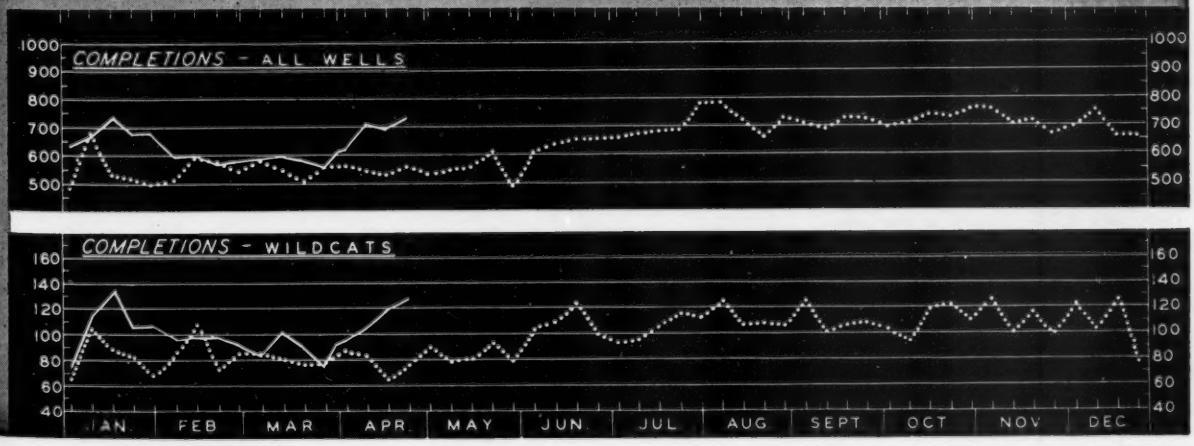
DAILY OPERATIONS

---- 1947 ——— 1948



WEEKLY COMPLETIONS

---- 1947 ——— 1948



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MARKETS

ONE major company in the Mid-Continent area last week increased its spot tank-car prices, Oklahoma (Group 3), ⅛ cent on both regular and premium gasoline, bringing its posted prices on these products to 10⅝ and 11⅝ cents per gallon, respectively. No. 6 fuel oil was reduced from $2.85 to $2.65 per barrel and crude scale wax 130-132 A.S.T.M. was again reduced by the same company to 7 cents from 7½ cents per pound.

Wholesale Prices Up

Continental Oil Co. announced an increase in tank-wagon prices of gasoline and other fuels of 3/10 cent effective May 3 to match a raise in freight rates within Oklahoma. The increase would affect gasoline, kerosine, tractor fuel, diesel fuel, and furnace oils. This increase was reported to be a reflection of the January 5 freight-rate increase and does not take into account the freight increase effective May 6.

Gasoline demand continued stronger in the Mid-Continent area with one marketer predicting that the peak demand will arrive in about 30 days. Few spot-gasoline sales were reported and premiums were said to be "high."

Some strengthening in the demand for No. 6 by the steel industry was reported by one refiner. For the past few weeks this product has been weakening, with proportional declines in quoted prices. One seller said spot market sales on No. 6 is still weak and that low-sulfur material is moving at around $2.50 to $2.60 per barrel.

Demand for kerosine continued slow in the Mid-Continent area, while inquiries for No. 2 remained fairly strong, but few movements were reported. One shipper said that he has been unsuccessful in moving some No. 2 at 9¾ cents per gallon.

Less Inquiries

In the New York Harbor area a slight easing of inquiry for spot material was reported, while prices remained firm. The majority of suppliers were said to be limiting their sales to old customers. One independent supplier dropped his price for No. 6 from $3.90 to $3.60 per barrel, tank cars and barges.

By late last week four major companies in the New York Harbor area were quoting $3.03 per barrel for No. 6 while one was quoting a high of $3.27. Demand for this material on the spot market remained firm but few sales were reported.

Prices along the Eastern Seaboard remained generally unchanged.

On the Texas Gulf Coast continuing improvement in demand for motor fuel was reported, although prices generally appeared to be little changed. Burning oils also were stronger with No. 2 moving at prices reported to be around 10½ cents per gallon. No. 6 heavy fuel oil was offered on the spot market at $3.05, but actual trading was said to be at a slightly lower figure.

Indicating the greatly increased production of refined products this year, stocks of the four major products in mid April were 11 per cent above stocks on April 17 last year. However, deliveries of these four principal products show 10.5 per cent gain over the same period a year ago.

Service station price of gasoline including taxes on April 1 was 25.77 cents, a drop of 0.01 cent per gallon from the previous month.

Representative Quotations

Representative spot-market quotations of leading suppliers as of May 3, 1948. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10½-12	11.6-12*	10.9-12½
		10.5-12.2†	
Premium gasoline, 78-80 octane	11½-13	10.6-13.4	12.9-13¼
42-44 w.w. kerosine	9½-10	10.2-12.2	10¼-10¾
No. 2 straw fuel oil	9- 9½	9.3-11.1	9.05-10
No. 6 residual	$2.50-2.65	$3.03-3.90	$2.56-2.80

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-14.5
750 vis., No. 3-4 neutral	15-17.25
2,000 No. 5-6 neutral	17-18½

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	30-33
200 vis. No. 3 neutral, 0-10 pp.	20-21

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	47
180 vis. p.t. neutral	45

CRUDE-SCALE WAX

Mid-Continent

130-132 A.S.T.M. melting point	7-7½

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Quality

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No influence could cause us to change the principles that have made our products famous and have won us our great reputation for

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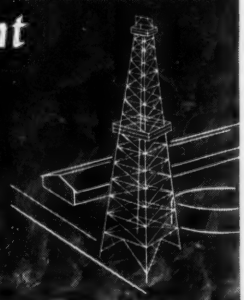
Norris Brothers, INC.
ROBINSON · ILLINOIS

how to prevent
mud losses



When mud starts losing to the formation, you can often avoid further trouble by using K-25 Industrial Fiber. Especially developed by Wood Conversion Company for oil field use, these treated, clean, new wood fibers have remarkable sealing qualities—felt together quickly, forming a dense fibrous mat. K-25 comes to you in compact bales—easy to handle—won't rot or deteriorate in storage or in the hole. Let us give you all the facts showing why K-25 Industrial Fiber is the modern way to stop mud losses. For complete information, write Wood Conversion Company, Dept. 204-58, First National Bank Building, St. Paul 1, Minnesota.

K-25 INDUSTRIAL FIBER

1st NATIONAL

STATEMENT OF CONDITION

At the close of business April 12, 1948

ASSETS

Cash on Hand and Due from Banks	$ 98,843,144.54
United States Securities Owned	51,918,993.92
Other Stocks and Bonds	8,353,111.25
Loans and Discounts	135,222,436.81
Banking House and Equipment	2,477,938.19
Other Assets	1.00
	$296,815,625.71

LIABILITIES

Capital Stock	$ 7,500,000.00	
Surplus Fund	7,500,000.00	
Undivided Profits, Net	6,082,162.47	$ 21,082,162.47
Reserved for Taxes, Etc.		1,965,656.79
DEPOSITS:		
U. S. Gov't	$ 4,684,307.18	
Other Deposits	269,083,499.27	273,767,806.45
		$296,815,625.71

First National Bank in Dallas
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

EQUIPMENT MEN ... in the News

Specialty Sales and Service, Inc. Formed

Specialty Sales & Service, Inc., Tulsa, recently has been formed as manufacturers' representatives in the

M. WALRAVEN, JR.

M. L. WALRAVEN

sale of oil-field equipment. The company is headed by M. L. Walraven, Jr., Tulsa, who is widely known throughout the oil-producing areas of the United States and Canada; and Walraven's brother, M. Les Walraven, who recently came to Tulsa from California to join Specialty. Both of these men are specialists in the field of hydraulic subsurface pumping and are now engaged in the supervision of manufacture, field-development work, and installation of the Dempsey hydraulic subsurface pump made by Dempsey Pump Co., Tulsa. Specialty is the exclusive representative of Dempsey Pump Co. in the sale of equipment and overseeing of advertising.

Specialty also represents Willis Oil Tool Co. of Long Beach in the sale of Willis variable-flow beans and flow-control valves in the Mid-Continent area.

The offices of Specialty Sales & Service, Inc., are located at 1426-27 Hunt Building, Tulsa.

Paris Purchases Hinderliter Houston Property

Henry Paris, president of Henry H. Paris Distributor, Inc., announces that his company has purchased the Houston properties of Hinderliter Tool Co., a division of the H. K. Porter Co., Inc. This property, located at 5104 Griggs Road, comprises 2½ acres and improvements.

"We do not contemplate any immediate removal from our present location at 1125 Rothwell Street. Our business has been increasing steadily during the past several years, and this purchase was made to provide for expansion when necessary," Paris said. The property is now under lease to Roberts Pipe & Tool Co. who will continue to occupy the location.

Henry H. Paris Distributor, Inc., are distributors and manufacturers' agents for an extensive line of oil-field and refinery equipment. The company has been operating in Houston for 20 years, and its sales territory covers the Gulf Coast and Mid-Continent.

Terry Russell Named Divisional Sales Manager

Terry Russell, well known in the petroleum industry, has been named Texas divisional sales manager of Hammond Iron Works, whose main offices are at Warren, Pa., and Port Neches, Tex. An M.E. graduate of University of Texas, member of Houston Nomads, the A.P.I., and A.S.M.E., Russell will make his headquarters at 531 Esperson Building, Houston, and at the Texas plant at Port Neches, where Hammond designs and fabricates cone-roof, vapor-lift, spherical, and other conservation storage tanks.

Hughes Announces Expansion Plans

Hughes Tool Co., Houston, announces the expansion of the company's executive staff including three new vice presidents elected by the board of directors. The newly appointed executives, Dan J. Martin, M. E. Montrose, and Harry E. Rogers, all have been associated with the company for some period of time and were promoted by the company to their new capacities after having completed exhaustive studies in their respective divisions during the past year in connection with the company's expansion program. Martin becomes vice president—engineering and research; Montrose, vice president—sales; and Rogers moves from his present capacity of manager of production to vice president—manufacturing.

In expansion of its executive branches, Hughes Tool Co. also announced the creation of an "Oil Industry Liaison Division," the principal purpose of which is to coordinate relations between the company and users of its product, as well as with the oil industry generally. The activities of the new executive division will include legislative study as it applies to the oil-drilling industry;

(Continued on page 163)

The deans of Oklahoma's three petroleum engineering schools as they judge 3,568 entries in Franks Manufacturing Corp.'s (of Tulsa) jingle contest for a first prize of a new Buick sedan and expenses to and from the International Petroleum Exposition May 15 to 22. The deans are, left to right, R. L. Langenheim of University of Tulsa; W. H. Carson of University of Oklahoma; and Edward R. Stapley of Oklahoma A. & M. College. The entries were received from 28 states and many foreign countries. The winner, to be announced at the Tulsa oil show, will receive his prize on Wednesday, May 19, in front of the Franks exhibit across from the show cafeteria

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PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street. N. W., Washington 5, D. C

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IF YOU have the available crude to economically operate a 5000 bbl. refinery, as to topping and cracking, please write me, Box 271, Tyler, Texas, on joint operation or purchase.

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Have up to $1,000,000 to spend for production. Would like a lease and production that has possibilities of additional drilling. Can give fast action on any desirable property. Send complete details:
Box C-316, The Oil and Gas Journal, Tulsa, Oklahoma

PERSONAL

Application for Membership in the Diesel Engineers International Assn.
576 Newark Ave., Jersey City, N. J.
Name .....
Address .....
Reference .....

Appalachian Fields

(Continued from page 150)

WEST VIRGINIA SUCCESSFUL WILDCATS

Barbour County, Phillips district: Hope Natural Gas Co. 9,173 Roberta A. Burner, 56,000 cu. ft. of gas, Benson sand TD 3,826 ft.

Putnam County, Pocatalico district: Godfrey L. Cabot, Inc., 1,259 J. L. McLean Hrs., 4,378,000 cu. ft. gas, elev. 794 ft., Corniferous lime 4,764 ft., Oriskany 4,864-98 ft., gas 4,864-72 ft., shot 4,864-79 ft., TD 4,898 ft.

WEST VIRGINIA WILDCAT FAILURES

Wood County, Steele district: United Fuel Gas Co. 6,211 M. A. Webber, dry, elev. 818 ft., Corniferous lime 4,519 ft., Oriskany 4,613-61 ft., Newburg 5,541-66 ft., Bix Six 5,703-35 ft., Clinton 6,075-6,141 ft., Red Medina 6,212-6,590 ft., and 6,595-6,607 ft., TD 6,625 ft.

Equipment Men

(Continued from page 158)

product research in the areas of new discoveries, both domestic and foreign; and development of greater assistance abroad among foreign drilling companies.

Ralph Neuhaus, vice president of the company, has been promoted to direct this newly created division, having been elected to the new post by the board of directors. Neuhaus has been associated with Hughes since 1921, joining the company as a draftsman and subsequently meriting promotion to chief engineer in 1939, manager of the Aircraft Strut Plant and a director of the company in 1942, and later was named vice president and general manager in 1945.

Hebner Attends Weco Sales Meeting

I. W. Hebner, Chicago industrial manufacturing and sales executive, attended the recent Well Equipment Manufacturing Corp. 3-day general sales meeting on Okadee products. Okadee products are distributed in the greater Mid-Continent oil area by the Weco organization.

Hebner is vice president in charge of industrial, oil-field, and marine sales for Okadee Co., Chicago. He was recently made a vice president and director of Viloco Railway Equipment Co. and Viloco Machine Co., with home offices in Chicago and the manufacturing plant in Benton Harbor, Mich.

Members of the Weco sales organization from throughout the entire Mid-Continent area were in attendance at the meeting.

H. G. Hagn, vice president and general manager; G. R. Winder, vice president and sales manager; and T. T. Word, Jr., assistant sales manager of Well Equipment Manufacturing Corp. addressed the sales group during the 3-day meet.

Redding With Leeds & Northrup 40 Years

Charles S. Redding recently observed his fortieth anniversary with Leeds & Northrup Co., manufacturers of electrical measuring instruments, automatic controls, and heat-treating furnaces. He has been president of the company since 1939, when he succeeded the founder, Morris E. Leeds, upon the latter's election as chairman of the board.

Redding first entered the employ of Leeds & Northrup as a draftsman in 1901, soon after his graduation from Northeast Manual Training School. The company then was 2 years old and had only 23 employes. He left the following year to enter University of Pennsylvania, where he was graduated a bachelor of science in electrical engineering in 1906.

Redding rejoined Leeds & Northrup in 1909 as a salesman. In 1917 he was made associate sales manager and subsequently became factory manager, treasurer, and vice president in charge of engineering and development. He succeeded to the presidency just before World War II.

Ryerson Announces Sales Appointments

W. E. Falberg, for the past 3 years head of special steel sales at the Cleveland steel-service plant of Joseph T. Ryerson & Son, Inc., has been appointed manager of alloy and stainless sales at the company's plant in Chicago.

E. H. Bodenmann, formerly a sales representative of the stainless-steel department of the Ryerson plant at Chicago, has been transferred to Cleveland, succeeding Falberg as manager of alloy and stainless sales.

Rowand Named B. & W. Chief Engineer

W. H. Rowand has been named chief engineer of The Babcock & Wilcox Co. The position is a new one created by the recent promotion of Alfred Iddles to the presidency of the company. Rowand will assume most of the engineering activities previously handled by Iddles.

New Denver Office For Wood Conversion Co.

Wood Conversion Co., manufacturers of Balsam-Wool and Nu-Wood insulation products, Tufflex felted wood-fiber blanket materials, and K-25 Fiber, announces the opening of a new western district sales office at 1513 Marion Street, Denver. The new office is under the direction of J. D. Spencer, western district sales manager of the company since December 1947.

Avondale to Convert LST's For Humble

Humble Oil & Refining Co. has awarded Avondale Marine Ways, Inc., of New Orleans, the contract for converting two additional LSTs for use as mobile power units for drilling marine oil wells off the coast of South Louisiana. This brings to four the number of ships of this type which are being converted at Avondale for Humble. Recreation and living accommodations will be provided for 59 persons. J. H. Bull, president of Avondale, said that work will start at once and will be completed in approximately 3 months.

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CALENDAR OF EVENTS

May

American Petroleum Institute, division of refining, thirteenth midyear meeting, Benjamin Franklin Hotel, Philadelphia, May 10-13.

International Petroleum Exposition, Tulsa, May 15-22.

American Petroleum Institute, Division of Production, Rocky Mountain district spring meeting, Townsend Hotel, Casper, Wyo., May 27-28.

Natural Gas and Petroleum Association of Canada, General Brock Hotel, Niagara Falls, Ontario, May 27-28.

Gas Technology Short Course, sponsored by the Southern Gas Association, Texas A. & I. College, Kingsville, May 31.

June

Petroleum Industry Electrical Association, Petroleum Electric Supply Association, and Petroleum Electric Power Association, joint conference, Hotel Adolphus, Dallas, June 1-3.

Southern Gas Association, third annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex., June 2-4.

National Oil Scouts & Landmen's Association, annual convention, Denver, June 3-5.

Petroleum Equipment Suppliers' Association, annual meeting, Broadmoor Hotel, Colorado Springs, June 6-8.

Society of Automotive Engineers, summer meeting, French Lick Springs Hotel, French Lick, Ind., June 6-11.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette and Phoenix Hotel, Lexington, Ky., June 17-18.

American Society of Testing Materials, fifty-first annual meeting, Book-Cadillac Hotel, Detroit, Mich., June 21-25.

American Petroleum Institute, Division of Production, eastern district meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 30, July 1-2.

Canadian Gas Association, annual convention, Jasper Park Lodge, Jasper, Alta., June 30-July 3.

September

The Instrument Society of America, third instrument conference and exhibit, Philadelphia Convention Hall, Philadelphia, September 13-17.

Pacific Coast Gas Association, annual convention, Hotel Casa del Rey, Santa Cruz, Calif., September 14-16.

October

American Institute of Mining & Metallurgical Engineers, petroeum division, fall meeting, Adolphus Hotel, Dallas, October 4-6.

American Association of Petroleum Geologists, midyear meeting, technical session and 3-day field trip, Pittsburgh, Pa., October 4-9.

American Gas Association, annual convention, technical section, Ambassador Hotel, Atlantic City, October 4-9.

National Lubricating Grease Institute, sixteenth annual convention, Edgewater Beach Hotel, Chicago, October 11-13.

American Association of Oilwell Drilling Contractors, eighth annual meeting, Rice Hotel, Houston, October 11-13.

Texas Mid-Continent Oil and Gas Association, twenty-ninth annual meeting, Fort Worth, October 14-15.

American Institute of Mining & Metallurgical Engineers, petroleum division, fall meeting, Elks' Club, Los Angeles, October 14-15.

November

American Petroleum Institute, annual meeting, Stevens Hotel, Chicago, November 8-11.

American oil Chemists' Society, fall meeting and technical sessions, Pennsylvania Hotel, New York, November 15-18.

March 1949

New England Gas Association, Hotel Statler, Boston, March 24-25.

NOMADS

Houston Nomads, second Monday of each month, The Houston Club, Houston.

Los Angeles Nomads, second Wednesday each month, Jonathan Club.

New York Nomads, dinner and entertainment, Sherry's, 49th Street and Park Avenue.